SpeedFam-IPEC

AvantGaard™ 676 Chemical Mechanical Planarization System

Installation Guide

Revision B

July 17, 1998

4409-106228-001 Standard Paper

4409-106228-002 Clean Room Paper

Revision and Change Record

Introduction

The table below summarizes the history of this document. It identifies the issue date, titles and dates of revisions and changes, and affected pages.

Updating Procedure

SpeedFam-IPEC Information Development and Delivery Department and SpeedFam-IPEC Engineering are responsible for the content and accuracy of information in this document. Although effort has been made to create a complete, accurate, and usable document to support SpeedFam-IPEC AvantGaard™ series equipment, quality improvement is an ongoing process.

To report any errors or inaccuracies in this manual, or to recommend quality improvement changes, complete the "Revision / Change Suggestion Form" located at the end of this manual and send it to SpeedFam-IPEC Information Development and Delivery.

REV.	CHG.	ISSUE DATE	TITLE	AFFECTED PAGES
A	N/A	**06/30/97**	AVANTGAARD™ 676 Installation Guide	Initial Issue
A.1	N/A	**10/30/97**	AVANTGAARD™ 676 Installation Guide	Various
B	N/A	**07/17/98**	AVANTGAARD™ 676 Installation Guide	Various

AvantGaard™ 676 Chemical Mechanical Planarization System

NOTE: **The graphics in this manual are for reference only and may not match the option configurations on the equipment at your site. Refer any questions on optional components to SpeedFam-IPEC Planar Technical Support Services.**

Copyright Information

This document contains information that is proprietary to SpeedFam-Integrated Process Equipment Corp. (SpeedFam-IPEC), and may not be duplicated, used, or disclosed for any purpose without written permission of SpeedFam-IPEC. This document is protected as an unpublished work under the U.S. Copyright Act of 1976, as well as under all other pertinent domestic and international intellectual property provisions.

Created June 30, 1997 through March 1, 2000. Copyright Integrated Process Equipment Corp. All rights reserved.

All trademarks not belonging to Integrated Process Equipment Corp. are referenced for informational purposes only and are the property of third parties

SpeedFam-IPEC Planar™, SpeedFam-IPEC Planar Commitment to Planarization™, and AvantGaard™ are proprietary trademarks of Integrated Process Equipment Corp.

Verification of Technical Data

Whenever possible and practical, SpeedFam-IPEC Planar™ technical manuals or portions thereof are verified at the factory by actually doing the procedures in the manuals. The verification process consists of doing the actual maintenance of the equipment precisely in accordance with the procedures specified in the applicable technical manual. Any required changes or corrections of the technical data, indicated by doing this verification, are then included into the manual.

The following listed sections of this manual have been verified at the factory on the date(s) indicated.

Verified Sections	Method	Verification Date
Control Systems	Simulation	June 30, 1997
Tool Operation	Simulation	June 30, 1997

Continued on next page

AvantGaard™ 676 Chemical Mechanical Planarization System, continued

Technical Assistance

For 24 hour Technical Support, Spare Parts, or Process Engineering, contact SpeedFam-IPEC Technical Support Hot Line at 1-877-NEED-CMP, 1-877-633-3267.

Table of Contents

Revision and Change Record ii
AvantGaard™ 676 Chemical Mechanical Planarization System iii

Introduction 1-1

Guide Details 1-3
Danger, Warning, Caution, and Note Icons 1-4
Additional Manuals 1-6
Wafer Fabrication Process Overview 1-7
Operator and Chase Side Views 1-10
Electrical Cabinet View 1-11
Tool Systems Overview 1-12
MP Modules 1-13
Wafer and Polish Heads 1-14
MP Upper Pneumatic Panels 1-15
MP Lower Pneumatic Panels 1-17
Cassette to Cassette (C2C) System 1-19
Wet Cassette Assembly 1-20
Wafer Sensor Array 1-22
C2C Pneumatic Panels 1-24

Continued on next page

Table of Contents, continued

Spray Box Assembly 1-27
Gencobot Robot 1-29
Hine® Robot Option 1-31
Robot Operations 1-35
Pad Conditioning System 1-36
Fluids System 1-38
Slurry System 1-39
Slurry Module 1-40
Electrical Cabinet 1-42
Interconnect Boxes 1-48
Brookside® Endpoint Detection System 1-50
Filmetrics® Endpoint Detection System 1-51
Luxtron Endpoint Detection System 1-52
Tool Operation 1-53

Site Preparation and Specifications 2-1

Site Preparation 2-2
Tool Dimensions 2-3
Facility Requirements 2-4

Continued on next page

Table of Contents, continued

Fluid Connections 2-6
Environmental Requirements 2-8
Exhaust Requirements 2-9

Safety Hazards and Precautions 3-1

Overview 3-2
Consequences of Safety Violations 3-4
Danger, Warning, Caution, and Note Icons 3-5
Emergency OFF (EMO) Circuit 3-14
System Interlocks 3-19
Alarm Messages 3-23
Mechanical Hazards 3-26
Electrical Hazards 3-41
Chemical Hazards 3-67
Material Safety Data Sheets 3-76
Cleaning and Spills 3-78
Airborne Noise Hazards 3-80
General Hazards 3-81
Laser Hazards 3-82

Continued on next page

Table of Contents, continued

S2-93 and CE Compliance 3-83
Moving the Tool 3-84

Unloading and Connection Procedures 4-1

Moving Procedures 4-2
Contents of Shipping Crates 4-3
Shipping and Storage Requirements 4-4
Receiving Inspection 4-5
Unloading 4-6
Uncrating Procedures 4-7
Move Main Tool and Electrical Cabinet Into Bay 4-9
Placement In FAB 4-10
SpeedFam-IPEC Installation Support 4-14
Required Support Equipment 4-15
Facilities Connection Procedures 4-17
Electrical Ratings 4-18
Facility Fluids Connections 4-19
Facilities Connections Checklists 4-20

Continued on next page

Table of Contents, continued

Setup and Fingerprint 5-1

Setup and Fingerprint 5-2

Installation Check Procedure 5-3

Fingerprint Equipment List 5-6

Tool Fingerprint Checklist 5-7

Qualification 6-1

Qualification 6-2

Qualification Requirements 6-3

Process Performance 6-4

Customer Qualification 6-5

Troubleshooting and Diagnostics 7-1

Introduction 7-2

Troubleshooting Tables 7-3

Glossary, Acronyms, and Abbreviations A-1

Glossary A-2

Acronyms and Abbreviations A-9

I/O Tables B-1

Continued on next page

Table of Contents, continued

Introduction....B-2
C2C Discrete I/O....B-3
C2C Analog I/O....B-31
MP Discrete I/O....B-32
MP Analog I/O....B-41

Mistic Driver Codes....C-1
Mistic Driver Error Codes....C-2
I/O Driver Generated Errors....C-5
G4LC32 Pass-Thru Errors....C-7
Servo Motion Control Unit Errors....C-9
Additional Error Codes....C-13

CE Mark Annex B Addendum....D-1
Annex B Addendum....D-2

Drawings....E-1

Revision / Change Suggestion Form....R/CSF-1

Continued on next page

List of Tables

Additional Manuals 1-6
Tool Systems 1-12
Head Assemblies 1-14
Robot Specifications 1-32
Robot Operations in a Typical Polish Cycle 1-35
Routine Polish Process For Each Individual Wafer 1-53
Tool Dimensions 2-3
Main Tool Fluids Connections and Specifications 2-7
676 Environmental Requirements 2-8
Exhaust Requirements 2-9
EMO Locations 3-17
System Interlock Locations and Descriptions 3-22
Light Tower Alarms 3-24
Lockout / Tagout Procedure 3-54
S2-93 Tool Area Classifications 3-57
AvantGaard™ 676 Sound Levels 3-80
Noise Level Examples 3-80
General Hazards 3-81
Laser Specifications 3-82
Shipping Crate Checklist 4-3
Acceptable Temperature and Humidity Levels 4-4
Uncrating Procedures 4-7
Move Main Tool And Electrical Cabinet Into Bay 4-9
Placement In Fab 4-10
Required Support Equipment 4-15

Continued on next page

List of Tables, continued

Electrical Ratings 4-18
Electrical Connections 4-20
Scrub Lines 4-21
Fluid and Pneumatic Supply Lines (Left To Right at Back of Main Tool) 4-22
Removing Shipping Restraints 4-23
Installation Check Procedure 5-3
SpeedFam-IPEC Supplied Tools 5-6
Tool Fingerprint Checklist 5-7
Source Inspection Criteria Summary 6-3
Customer Qualification 6-5
System Troubleshooting Table 7-3
User Interface Troubleshooting Table 7-4
MP Troubleshooting Table 7-5
Wet Cassette Troubleshooting Table 7-7
Robot Troubleshooting Table 7-8
Glossary A-2
Acronyms and Abbreviations A-9
I/O Definitions B-2
C2C Discrete I/O B-3
C2C Analog I/O B-31
MP Discrete I/O B-32
MP Analog I/O B-41
Mistic Driver Error Codes C-2
I/O Driver Generated Errors C-5
G4LC32 Pass-Thru Errors C-7

Continued on next page

List of Tables, continued

Servo Motion Control Unit Errors C-9
Additional Error Codes C-13
Annex B Details D-2

Continued on next page

List of Tables, continued

Notes:

List of Figures

Typical Operator And Chase Side Views 1-10
Typical Electrical Cabinet 1-11
MP Modules 1-13
Wafer Head and Polish Head 1-14
MP Upper Pneumatic Panel Assembliy 1-15
MP Lower Pneumatic Panel Assemblies 1-17
Cassette to Cassette (C2C) System 1-19
Wet Cassette Assembly 1-20
Wafer Sensor Array 1-22
Typical C2C Upper and Lower Pneumatic Panels 1-24
Closed Loop Delta P C2C Upper and Lower Pneumatic Panel Assemblies 1-25
Spray Box Assembly 1-27
Spray Box Assembly - Interior 1-28
Gencobot Robot Body 1-29
Link Arm Custom Wrist and Arm 1-30
Hine® Robot Body 1-31
Hine® Robot Teach Pendant and EMO Switch 1-33
Pad Conditioning System 1-36
Slurry System Filters 1-39
Typical Slurry Module 1-40
Electrical Cabinet Control Station 1-43
Typical Electrical Cabinet Low Voltage Swing Panels 1-45
Interconnect Boxes 1-49
Typical End Point Computer Panel Assembly 1-50
Luxtron Endpoint Detection Display 1-52

Continued on next page

List of Figures, continued

Typical Tool Installation 2-4
Main Tool Fluids Connections 2-6
EMO Locations 3-16
EMO Electrical Wiring Schematic 3-18
System Interlock Locations 3-21
Light Tower 3-25
High Voltage Locations 3-47
External (Protective Earth) Ground Location 3-52
Main Tool and Electrical Cabinet Ground Bonding Connections 3-53
Material Safety Data Sheet - Front and Rear (Typical) 3-77
Typical Seismic Restraint Mounting 4-12
Typical View of Seismic Restraints on Main Tool 4-13
Typical Main Tool Facility Fluids Connections 4-19

Continued on next page

Chapter 1

Introduction

Contents This chapter contains the following topics:

Topic	See Page
Guide Details	1-3
Danger, Warning, Caution, and Note Icons	1-4
Additional Manuals	1-6
Wafer Fabrication Process Overview	1-7
Operator and Chase Side Views	1-10
Electrical Cabinet View	1-11
Tool Systems Overview	1-12
MP Modules	1-13
Wafer and Polish Heads	1-14
MP Upper Pneumatic Panels	1-15
MP Lower Pneumatic Panels	1-17
Cassette to Cassette (C2C) System	1-19
Wet Cassette Assembly	1-20
Wafer Sensor Array	1-22
C2C Pneumatic Panels	1-24

Continued on next page

Contents, continued

Topic	See Page
Spray Box Assembly	1-27
Gencobot Robot	1-29
Hine® Robot Option	1-31
Robot Operations	1-35
Pad Conditioning System	1-36
Fluids System	1-38
Slurry System	1-39
Slurry Module	1-40
Electrical Cabinet	1-42
Interconnect Boxes	1-48
Brookside® Endpoint Detection System	1-50
Filmetrics® Endpoint Detection System	1-51
Luxtron Endpoint Detection System	1-52
Tool Operation	1-53

Guide Details

Overview

This Installation Guide is a reference guide for owner/installers of the SpeedFam-IPEC AvantGaard™ 676 Chemical Mechanical Planarization System.

Contents

This guide contains the following subjects of interest to the owner/installer.

- An overview of the tool and how it functions.
- Refer to Chapter 3 for a complete discussion of the possible safety hazards and precautions when using the tool.
- Requirements for preparing the installation site.
- How to unpack, move, and install the tool.
- Fingerprint and Qualification procedures for the tool. (Refer to the AvantGaard™ 676 Maintenance Manual for a complete explanation of tool maintenance operations.)
- A listing of Mistic Driver Codes and I/O Tables to be used in Troubleshooting and Diagnostics.
- Drawings.

About This Manual

The first page of each chapter gives a list of the subjects discussed in the chapter.

Refer to the Index at the end of this guide to locate specific topics.

Danger, Warning, Caution, and Note Icons

Definitions

To emphasize and to make clear the importance of Danger, Warnings, Cautions, and Note icons in the manual and on the AvantGaard™ 676, the definitions and formats shown on the following pages are used. If you do not pay attention to them, and the safety information they contain, you can be injured, lose your life, or damage the product or the tool. Refer to Chapter 3 for a complete discussion of the possible safety hazards and precautions when using the tool.

In the AvantGaard™ 676 manuals, all Dangers, Warnings, and Cautions are located directly above the text to which they apply, and Notes are located directly below the text to which they apply.

DANGER - THESE SYMBOLS ARE USED IN THE MANUAL, AND ON LABELS IN THE TOOL, TO ALERT THE USER TO THE PRESENCE OF DANGEROUS VOLTAGE, WITHOUT INSULATION, IN THE TOOL ENCLOSURE(S). PERSONAL INJURY OR LOSS OF LIFE WILL RESULT IF PROPER OPERATING PROCEDURES, PRACTICES, ETC. ARE NOT CORRECTLY FOLLOWED.

WARNING - THESE SYMBOLS ARE USED IN THE MANUAL, AND ON LABELS IN THE TOOL, TO ALERT THE USER TO THE PRESENCE OF PINCHING AND CRUSHING HAZARDS. PERSONAL INJURY OR LOSS OF LIFE CAN RESULT IF PROPER OPERATING PROCEDURES, PRACTICES, ETC. ARE NOT CORRECTLY FOLLOWED.

Continued on next page

Danger, Warning, Caution, and Note Icons, continued

CAUTION - This symbol is used in the manual, and on labels in the tool, to alert the user to the presence of important operation and maintenance information, which, if not strictly observed, can result in damage to, or destruction of, equipment.

CAUTION - This symbol is used in the manual, and on the tool, to alert the user to the presence of chemical risk or hazard of an operating procedure or practice, which, if not correctly followed, can result in personal injury or bodily damage to personnel.

NOTE:

This symbol is used in the manual to alert the user to additional information, operating procedures, or conditions, which should be read and understood to aid in the use operation, or maintenance of the wafer polisher.

This symbol is used on the label in the tool that identifies the external ground (protective earth) location.

This symbol is used on labels in the tool to identify ground (functional earth) terminals, terminal blocks, and grounding locations.

Additional Manuals

Additional Manuals

Table 1-1 lists the manuals available for the AvantGaard™ 676 Chemical Mechanical Planarization System. Contact SpeedFam-IPEC MultiMedia Publications for additional copies of these manuals.

Table 1-1. Additional Manuals

Name	Number	Description
AvantGaard™ 676 Installation Guide	4409-106228	Instructions and facility requirements for proper installation of the AvantGaard™ 676.
AvantGaard™ 676 Illustrated Parts Breakdown	4409-106225	An illustrated parts breakdown of the assemblies and components in the AvantGaard™ 676.
AvantGaard™ 676 Maintenance Manual	4409-106227	A handbook and reference manual for maintenance personnel.
AvantGaard™ 676 User Manual	4409-106226	An operational handbook and user reference manual for the AvantGaard™ 676.
AvantGaard™ 676 Computer Host Interface Manual	4409-106220	Information about the optional serial communication interface. (The interface conforms to the SECS I/II protocol standard.)
AvantGaard™ 676 CD-ROM Manual Set	4409-106224	A full color, interactive CD-ROM, containing the AvantGaard™ 676 Illustrated Parts Breakdown, Maintenance and User Manuals.

Wafer Fabrication Process Overview

Introduction

The AvantGaard™ 676 tool plays a very important role in the process of moving wafers through various production steps. With each process stage, the wafer becomes more and more valuable. It also becomes increasingly critical for process tools to do their work with precision. The tool polishes specific layers off the top of the wafer and maintains as “planar” a surface as possible.

Processing

During wafer fabrication, metal layers are deposited on the wafer to fill patterned through holes and trenches outlined by oxide layers. When filled with metal, these holes and trenches become bridging contacts that connect various components throughout a multiple layered device. Oxide layers, known as ILD (InterLayer Dielectric), insulate between each metal layer and, when polished and etched, they contain the connective patterns which are filled by the next metal layer. After the ILD is overlaid with metal, the wafer must be polished to remove excess metal (down to the ILD surface) so the metal remains only in the etched patterns. This process, Chemical-Mechanical Planarization (CMP), is used to make the wafer surface as flat, or planar, as possible.

CMP

CMP occurs through a combination of mechanical and chemical action. Mechanically, the wafer is positioned between two heads that apply specific pressures and polishing motions, calculated to maximize planarization. Chemically, the action of the slurry softens the surface layer of the metal (tungsten) or oxide. The abrasive slurry on the surface of the pad in combination with pressure and velocity remove the softened surface layer and the slurry fluid carries the removed material away. This exposes a fresh surface layer and the process starts over.

Polish Dynamics

Once the head assembly has closed onto a wafer, the upper (wafer) head begins to rotate. Internal Kaydon roller bearings allow the head to spin in the assembly. The wafer head rotates at a speed that is variable from recipe to recipe but seldom exceeds 10 RPM (16 RPM with the High Speed Option). Speeds are adjusted in the polish recipe to achieve optimal results for various types of polish procedures and materials. The lower (polish) head moves in the opposite direction in a wave generating path. The speed of the polish head is faster by a 16 to 1 ratio, (32 to 1 ratio with High Speed Option) but is directly proportional to the rotational speed of the wafer head.

Continued on next page

Wafer Fabrication Process Overview, continued

Polish Dynamics, continued

Two 208V 3 phase motors are used in each MP assembly, one for the wafer head, and one for the polish head. These motors supply the movement of the heads and are controlled through the high voltage MP panel assemblies in the Electrical Cabinet. Although the two assemblies are driven by independent motors, they use the same inverter.

Fluids are introduced into the polish process through the polish pad. The pad is ported with small holes that introduce measured quantities of slurry and/or DI water to the process. The wafers are polished by the interaction of polish pad motion, pressure, and the chemical properties of the slurry being used. Polish recipes (chosen by the operator) control polish parameters, including polish time, slurry mixtures, polish and wafer pressures, and motor speed.

The end of the wafer polishing procedure is determined either by recipe or by the endpoint computer monitoring the current draw of the two motors. The current draw changes from the friction variations of Tungsten and TiN materials being polished. It is this change that signals the endpoint.

Testing Polishing Outcomes

After the polishing process is complete, an operator can do various test procedures on the wafers to make sure all process specifications have been met. Testing can also be used to give an indication of average removal rate, uniformity, and particle contamination.

Removal

Average removal rate is the average rate of tungsten removal during polishing. It is measured in angstroms per minute (Å/min) using either a ResMap or OmniMap metal thickness measuring tool.

Uniformity

Uniformity is a measure of how consistent the removal rate is across the wafer. Uniformity (or more accurately, non-uniformity) is calculated by multiplying the sample standard deviation by 3, and dividing by the average removal rate.

Both removal rate and uniformity are calculated. The tool uses a 4 point probe to get sample data from the wafer.

Continued on next page

Wafer Fabrication Process Overview, continued

Particle Count Particle contamination can be detected using a “SurfScan” tool which scans the surface of a wafer in order to detect evidence of contamination. Because contaminant particles are extremely small, the SurfScan tool uses a laser to reflect light off the surface of the wafer and then analyzes the light diffraction patterns to identify and locate existing particles. Process engineers post limits on the number of particles that are acceptable per wafer. This figure is known as the upper control limit, or UCL. SurfScan measurements can be done periodically to check the contamination level of wafers moving through the tool.

Operator and Chase Side Views

Figure 1-1. Typical Operator And Chase Side Views

Electrical Cabinet View

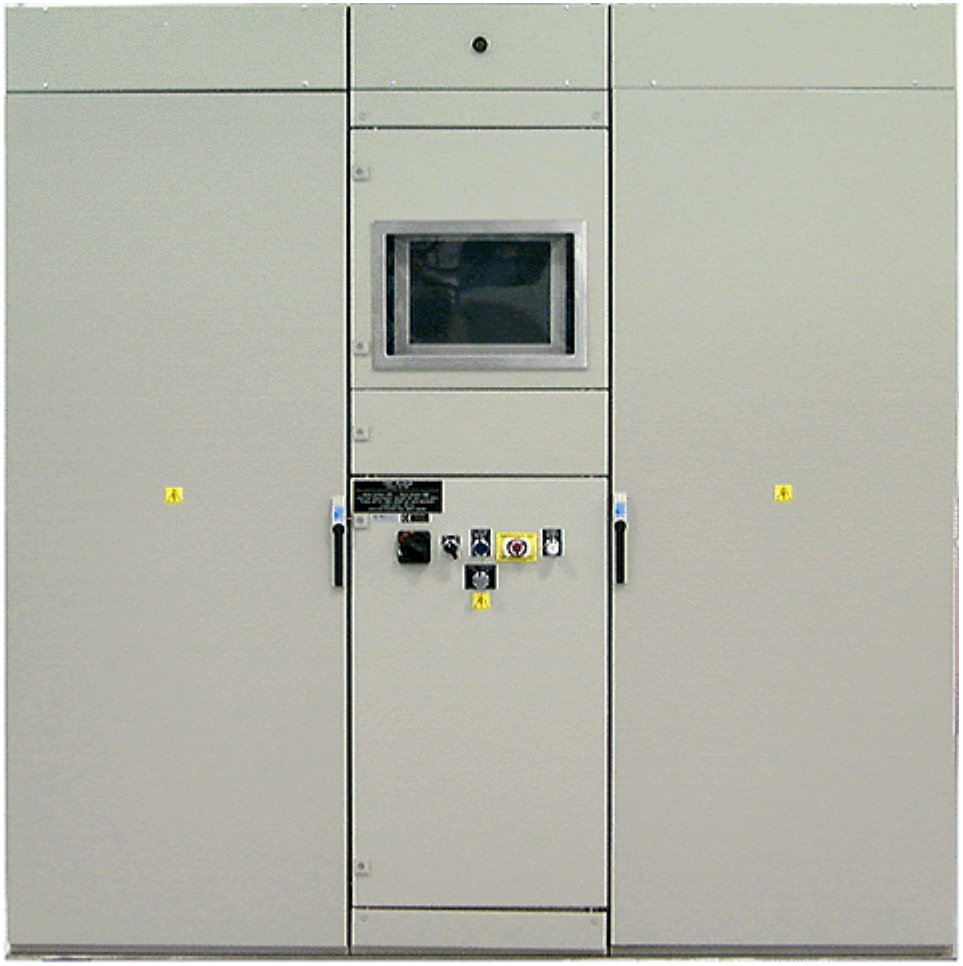


Figure 1-2. Typical Electrical Cabinet

Tool Systems Overview

Tool Systems

There are six main modules or systems in the AvantGaard™ 676. Refer to Table 1-2 for a brief description of each module / system.

Table 1-2. Tool Systems

Module / System	Description
MP Modules	Components directly involved with the wafer polishing process. Refer to page 1-13.
Cassette to Cassette (C2C) System	Components controlling wafer storage, sensing, rinsing, and movement of wafers through the tool. Refer to page 1-19.
Pad Conditioning System	Cleans and conditions the polish pads. Refer to page 1-36.
Fluids System	Components controlling the supply, distribution, and removal of process fluids and scrub air. Refer to page 1-38.
Electrical Cabinet	Supplies computer/logic control and electrical power distribution and conversion to various tool components and systems. Refer to page 1-42.
Brookside® Endpoint Detection System	Detects the end of the polish cycle. Refer to page 1-50.

MP Modules

Description

There are four MP modules in each tool. The MP modules consist of the components and assemblies that are directly involved in the wafer polishing process. The major MP module assemblies are the Wafer and Polish Heads, MP Upper Pneumatic Panels, and the MP Lower Pneumatic Panels.

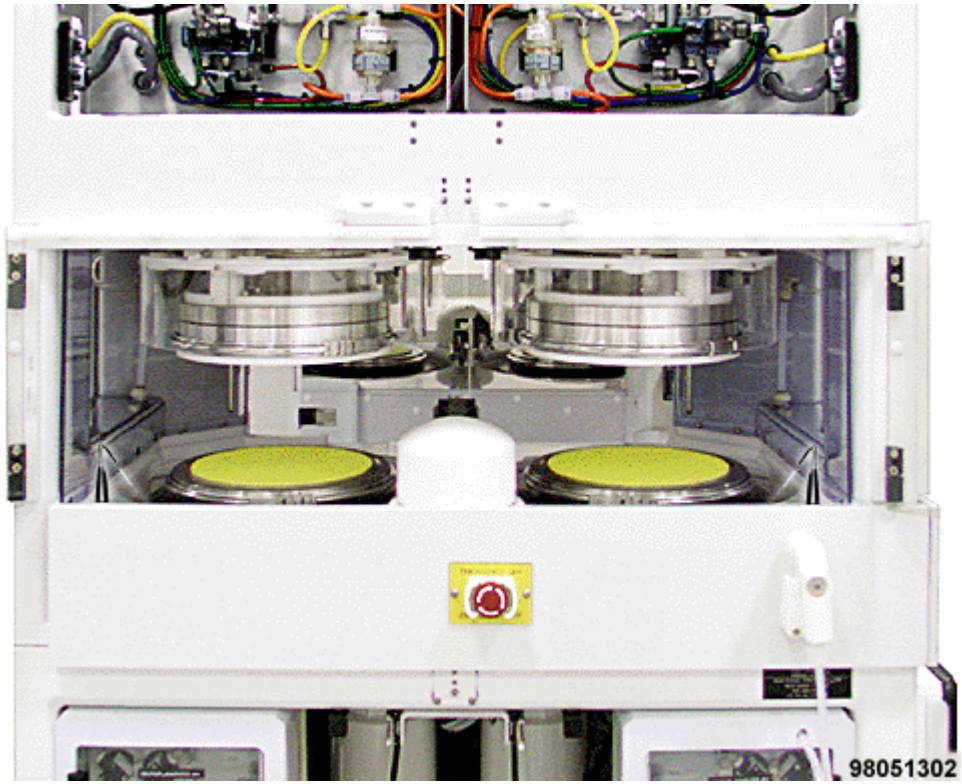


Figure 1-3. MP Modules

Wafer and Polish Heads

Description

Two separate head assemblies, the wafer head and the polish head, work at the same time during the wafer polishing process. The upper head is called the wafer head, the lower is called the polish head. Refer to Table 1-3.

Table 1-3. Head Assemblies

Item	Description
Wafer Head	The wafer head is located on the upper half of the tool, directly over the polish head. Its main function is to place and hold the wafer in contact with the polish head during the polish process.
Polish Head	The polish head is located on the bottom half of the tool, below the wafer head. Its main function is to supply the polishing action that removes the material from the top of the wafer. The polish head has a specially designed polish pad attached to its surface which is the source of the “scouring” friction.

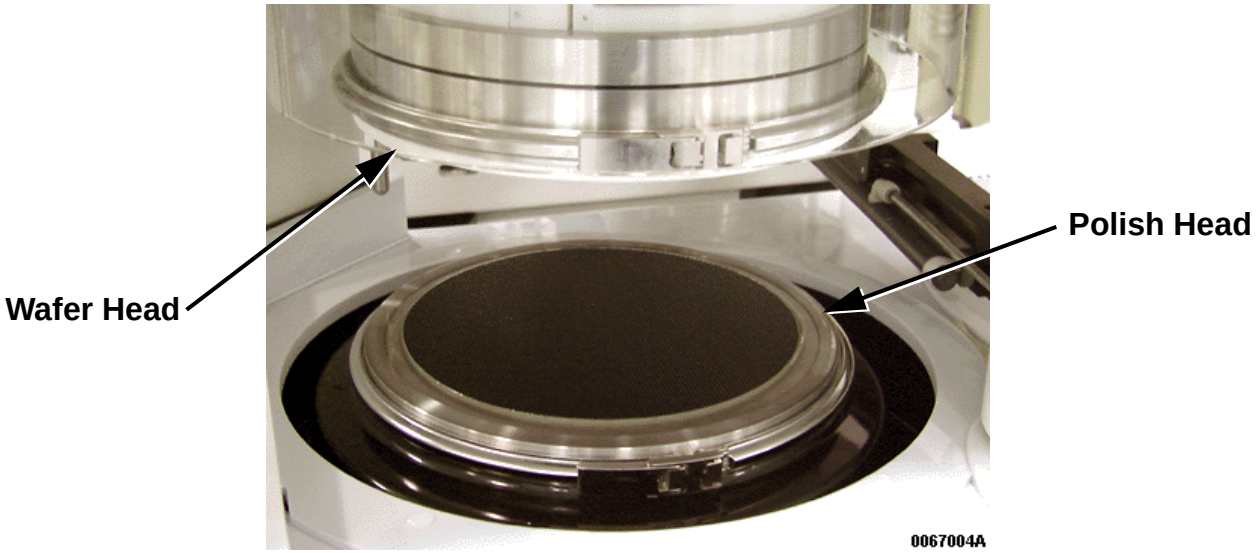


Figure 1-4. Wafer Head and Polish Head

MP Upper Pneumatic Panels

Introduction

The four MP upper pneumatic panel assemblies supply air and sensor signal routing for the wafer head assemblies. One MP upper pneumatic panel assembly is located on the tool frame above each wafer head assembly.

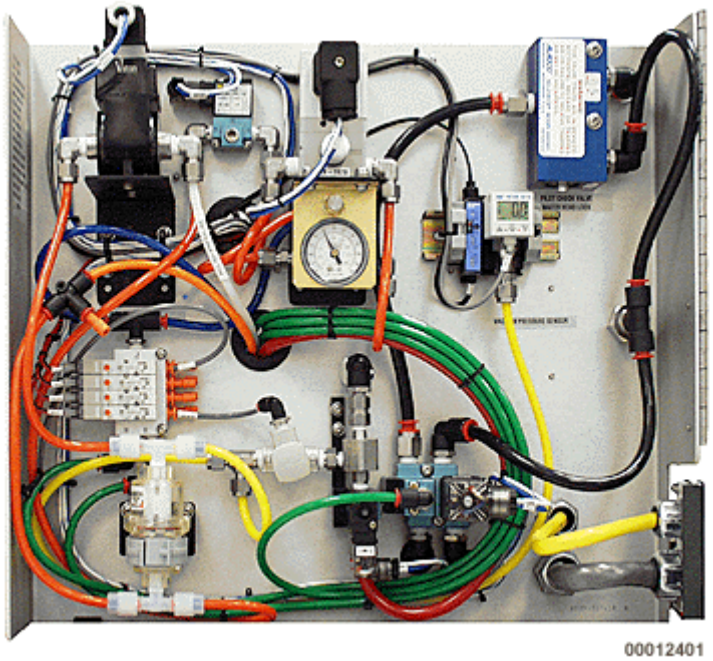


Figure 1-5. MP Upper Pneumatic Panel Assembliy

Continued on next page

MP Upper Pneumatic Panels, continued

Functions

The MP upper pneumatic panels are used in the system operations which generally take place in the upper half of the tool in the MP module. There is a separate panel for each MP wafer head.

Primary functions include:

- Raising, lowering, and parking the wafer head.
- Control of wafer vacuum and pressure to the wafer head itself.

Secondary functions:

- Monitoring the slurry shield sensors.

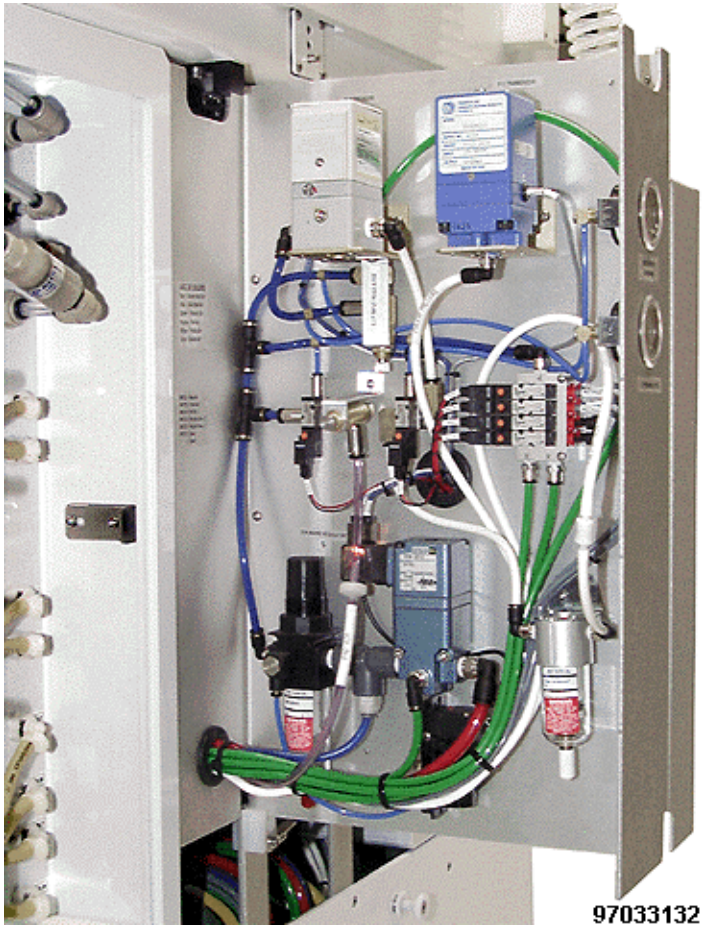
Slurry Shields

The slurry shield sensors monitor the raising and lowering of the slurry shields which surround the heads during a polishing cycle. If the slurry shield sensors detect an open or an obstruction blocking the shield from lowering, a “shield interlock violation” will occur, stopping the head from lowering, and raising it back to the up position. The shields form a barrier around the polish heads to prevent slurry or other matter from being thrown outside the polish area.

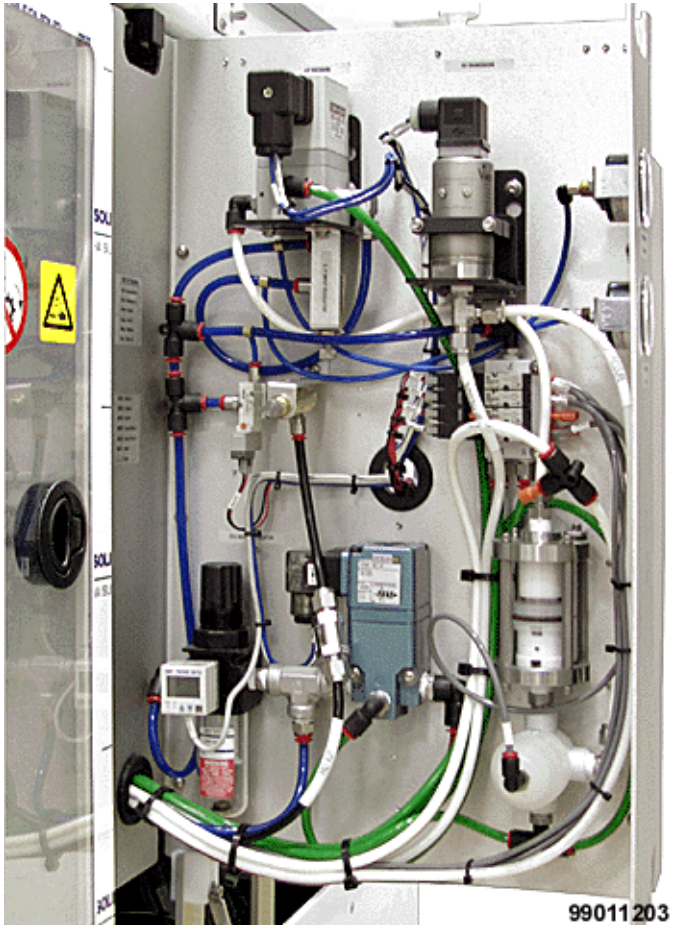
MP Lower Pneumatic Panels

Introduction

The MP lower pneumatic panel assemblies are located on the lower right and left side of the tool. These panel assemblies are perpendicular to the upper pneumatic panel assemblies and slide in and out on rails for easy access.



Typical



Closed Loop Delta P

Figure 1-6. MP Lower Pneumatic Panel Assemblies

Continued on next page

MP Lower Pneumatic Panels, continued

Functions

There is a separate panel for each MP polish head. These panels are used in the system operations which generally take place in the lower half of the tool in the MP module.

Primary function:

- Supply and regulation of polish pressure during the polish cycle.

Secondary functions:

- Supply and regulation of air lines for the MP polish head.
- Air filtration.
- Head Park position sensor signal routing.

The pneumatic filtering system cleans incoming air used in the MP lower pneumatic panel. Pad air is supplied and regulated to flow through holes in the polish pad. When a polishing cycle is completed, and the wafer head rises off the polish head, regulated air is directed through the pad to break the wafer-to-polish pad surface tension, so the robot wand can pick up the wafer.

Cassette to Cassette (C2C) System

Introduction

The Cassette to Cassette (C2C) system includes the components and assemblies involved with wafer storage, sensing, rinsing, and movement throughout the tool. The major C2C components and assemblies are the Wet Cassette Assembly, Wafer Sensor Array, C2C Pneumatic Panels, Spray Box Assembly, and the Gencobot Robot.

Cassette to Cassette (C2C)

The C2C system uses a multi-axis robot with a wafer pickup safety wand. The robot allows computer controlled loading, unloading, and transport of wafers from location to location in the tool. The C2C system also includes a wafer sensing mechanism which automatically senses the number of wafers loaded into the cassette and communicates the count to the system control (SysCon) computer.

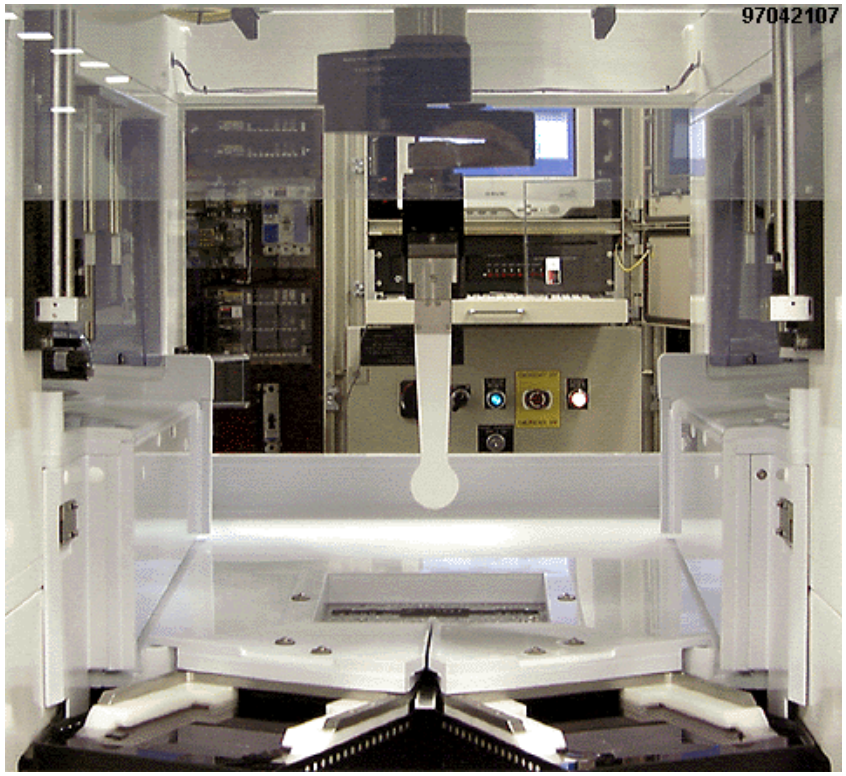


Figure 1-7. Cassette to Cassette (C2C) System

Wet Cassette Assembly

Introduction

The wet cassette assembly, located in the lower middle section on the operator side of the tool, is used for both prepolish and postpolish wafer storage. The wet cassette assembly consists of the cassette basins, DI water manifolds, carrier lift towers, and two wafer cassettes.

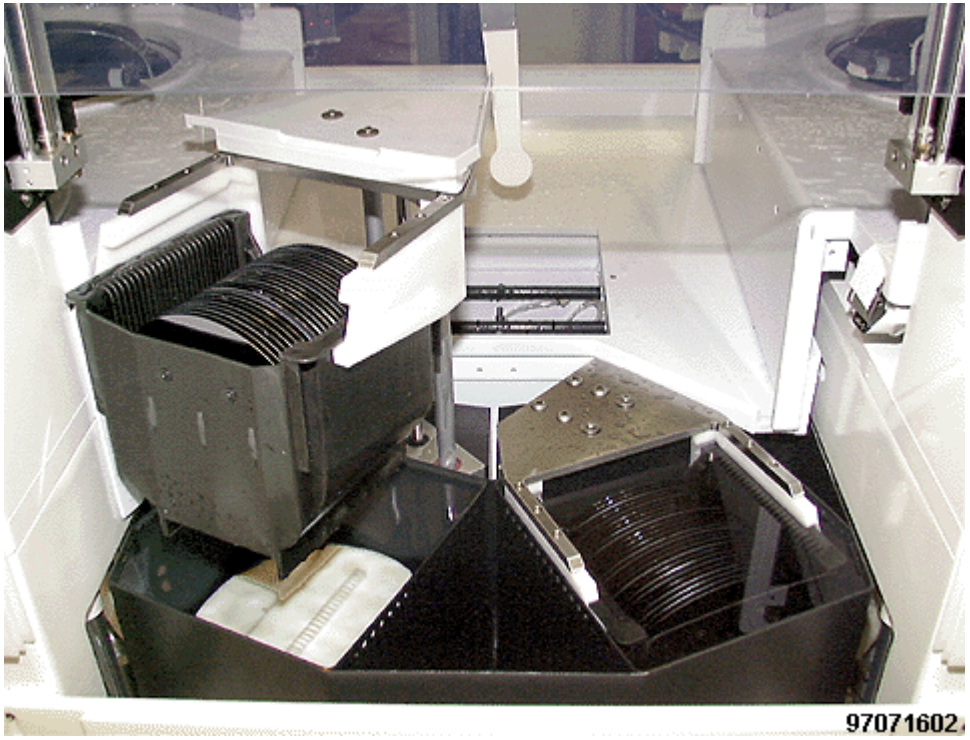


Figure 1-8. Wet Cassette Assembly

Continued on next page

Wet Cassette Assembly, continued

Components

The cassette basin is a dual container which is filled with DI water and holds both wafer cassettes. At the bottom of each cassette compartment is the DI water manifold (DI manifold, wafer comb). Its purpose is to accurately seat the wafer cassette, correctly position each wafer, and supply an even flow of DI water in the wafer cassette. The carrier lift tower, located behind and connected through the cassette basin, lifts and rotates the carrier out of the storage basin to the operator access door so wafer cassettes can be loaded and unloaded. The wafer cassette slides into channels on the sides of the carrier lift arms. The wafer cassettes are removable cassettes which hold 25 wafers.

Cassette Loading and Unloading

During a loading or unloading procedure, the carrier lift tower raises the wafer cassette out of the cassette basin, rotates the carrier with its cassette toward the operator, and the operator access door slides open. The operator can then unload the wafer cassette from the carrier, or load a new one.

Wafer Sensor Array

Introduction

The wafer sensor array is a sensing mechanism which determines the number and position of wafers loaded into a wafer cassette. It is located on the operator side of the tool on the upper frame directly above the wet cassette assembly.

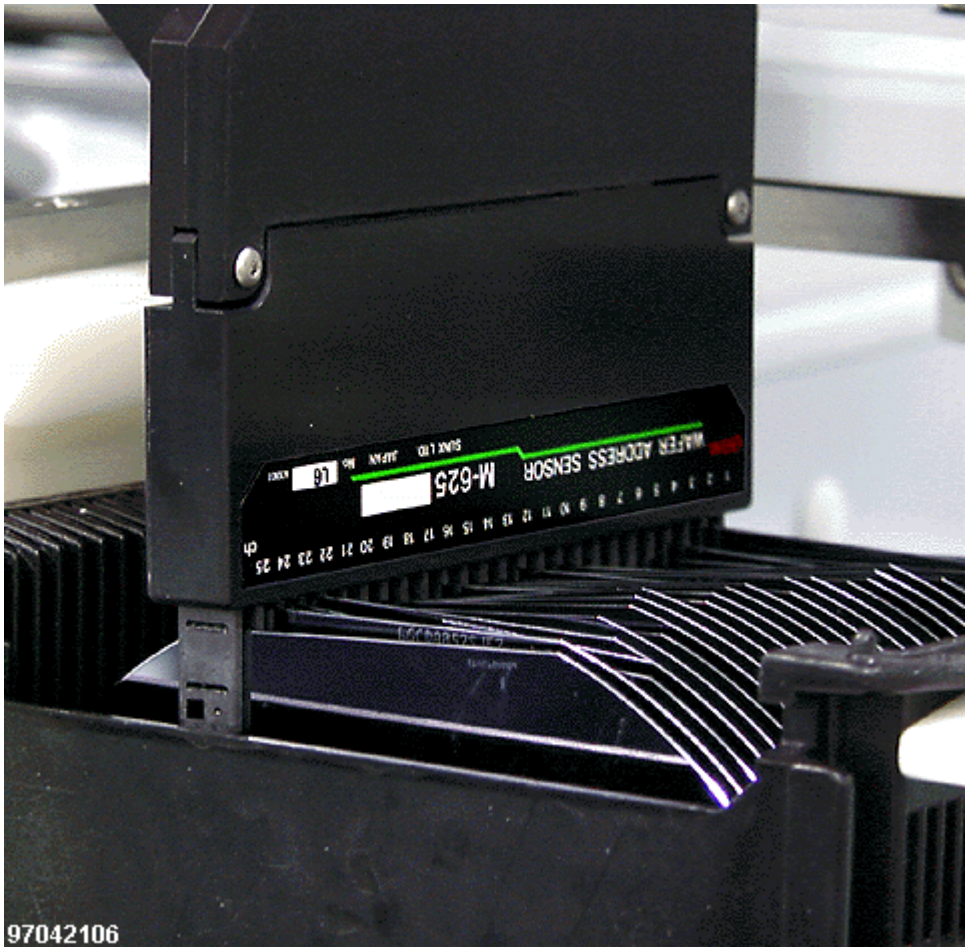


Figure 1-9. Wafer Sensor Array

Continued on next page

Wafer Sensor Array, continued

Description

The array consists of two 25 slot wafer sensor heads attached to a flexible control cable. They are located on either side of the vertical operator access frame and each serves one side of the wet cassette assembly. Refer to Figure 1-9 on page 1-22.

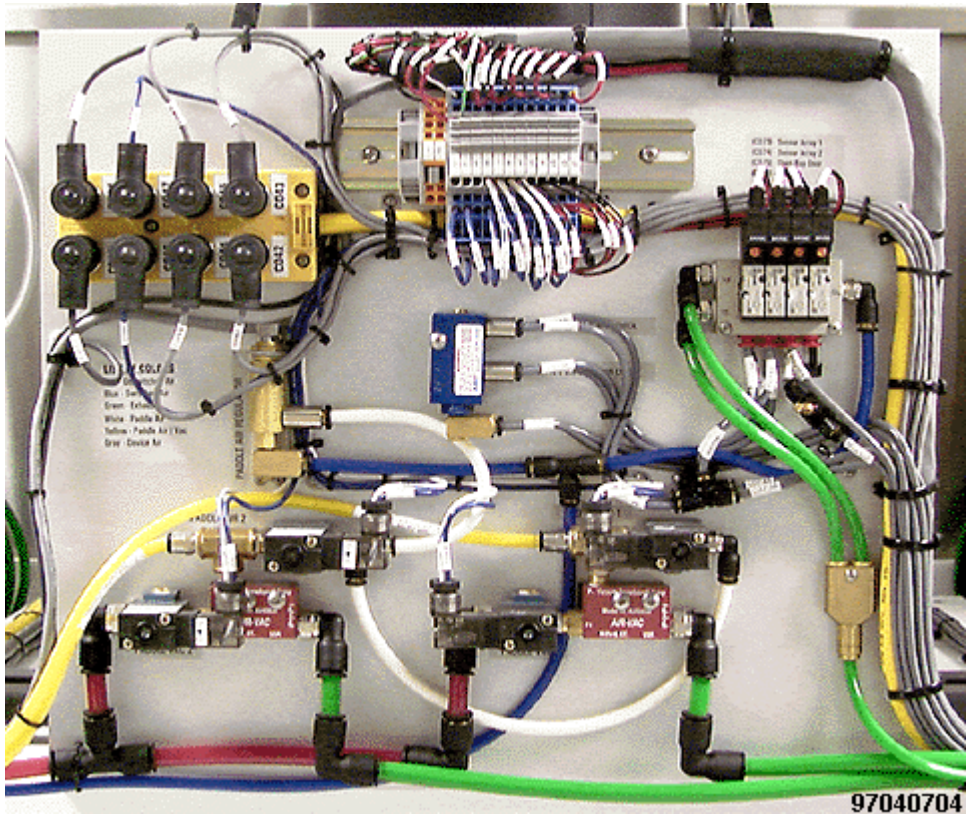
Function

The wafer sensor array is activated automatically after the operator loads a wafer cassette into the port. When the send command is issued, the wafer cassette is lifted out of the cassette basin. The port and its cassette are turned to the operator and the operator access door is raised. After the operator loads a new wafer cassette into the port and issues the continue command, the software logs in the new cassette, then the operator issues the register command. The wafer sensor head will then automatically descend, placing its sensing channels between the wafers in the cassette. The sensor determines which slots are full and feeds this information to the system computer so that accurate wafer identification and processing can occur. The wafer sensing head then raises back to its home position and the port turns and lowers the wafer cassette back to its processing position in the cassette basin.

C2C Pneumatic Panels

Introduction There are two C2C pneumatic panels on the tool, an upper and lower panel. These should not to be confused with the MP Upper Pneumatic Panels and MP Lower Pneumatic Panels.

Location The C2C upper pneumatic panel is located in the middle of the upper frame on the chase side of the tool. The C2C lower pneumatic panel is also located on the chase side of the tool, but is located in the lower middle section of the frame. Refer to Figure 1-11 for Closed Loop Delta P C2C Upper and Lower Pneumatic Panel Assemblies.



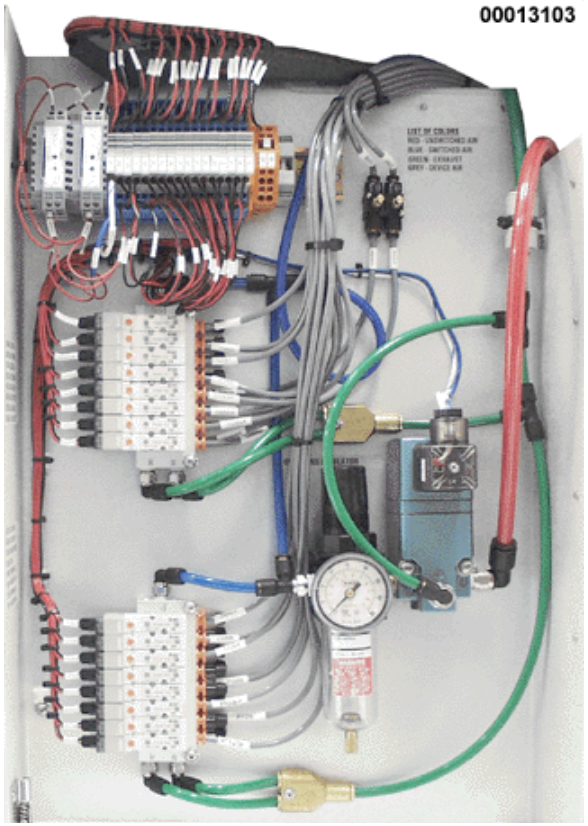


Figure 1-10. Typical C2C Upper and Lower Pneumatic Panels

Continued on next page

C2C Pneumatic Panels, continued

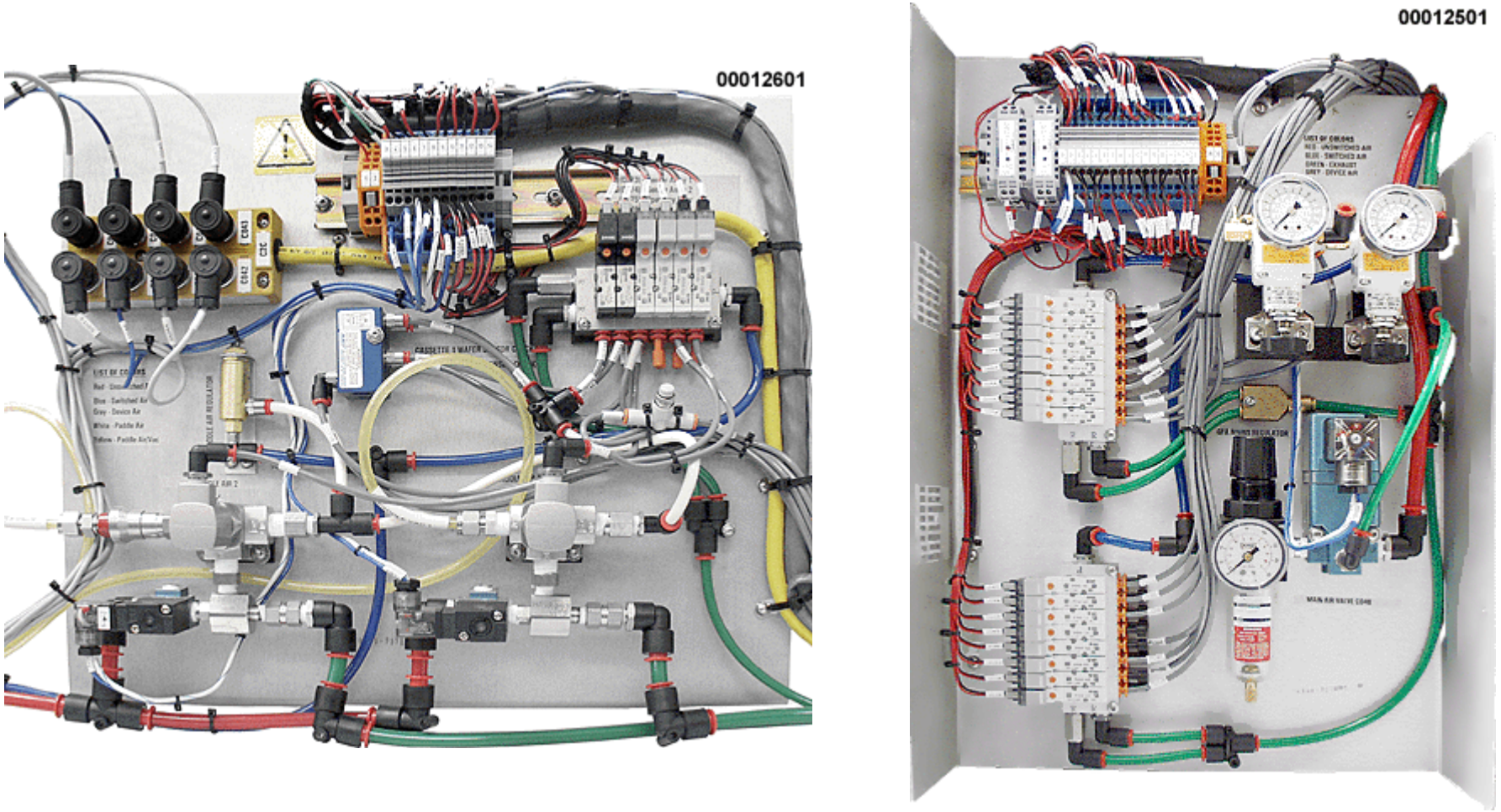


Figure 1-11. Closed Loop Delta P C2C Upper and Lower Pneumatic Panel Assemblies

Continued on next page

C2C Pneumatic Panels, continued

Upper Panel Functions

Major functions of the C2C upper pneumatic panel include:

- Air supply
- Vacuum generation

The upper panel controls the wafer sensor array, the robot wand, and the operator door.

Lower Panel Functions

Major functions of the C2C lower pneumatic panel:

- Air supply for lifting and turning the wafer cassette carrier lift towers
- Wet cassette DI water by-pass valve (Laminar flow)
- Valve module which controls slurry on/off
- Slurry purge on/off
- Pad conditioner rinse
- Spill sensor that detects spills during tool operation

Spray Box Assembly

Introduction

The spray box assembly is the process station used immediately after wafer polishing. It is located in the middle of the tool, and is used as a rinsing station to remove slurry residue from the wafers.

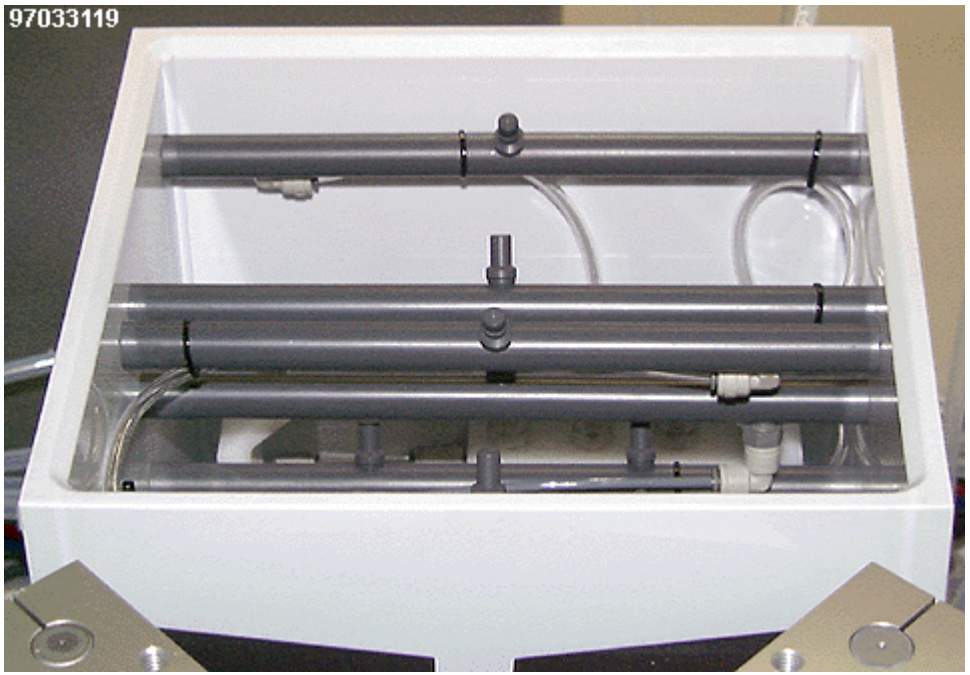


Figure 1-12. Spray Box Assembly

Continued on next page

Spray Box Assembly, continued

Description

The spray box has two access ports and can hold and clean two wafers at the same time. Inside, there are two sets of bars with single jets angled to rinse the top half of the wafer and two sets of bars with double jets angled to rinse the bottom half of the wafer. There is also a single pneumatic jet to blow dry the wand. DI water supply and drainage lines supply and remove fluid from the spray box.

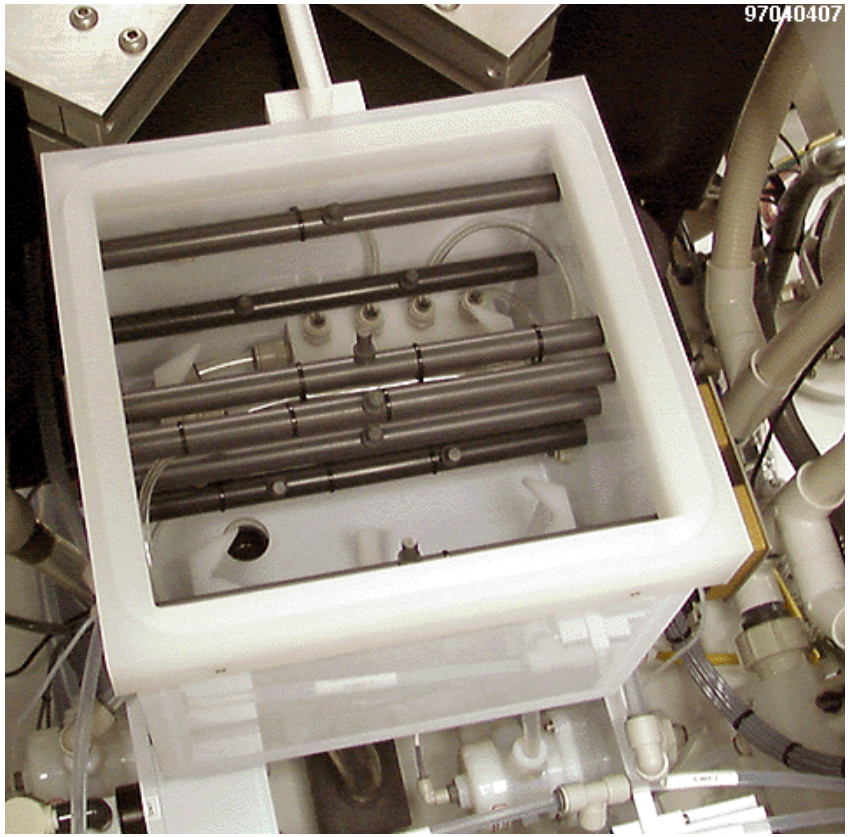


Figure 1-13. Spray Box Assembly - Interior

Gencobot Robot

Introduction

The robot is responsible for all wafer movement in the tool. It is located in the center of the tool. The robot body extends above the top frame and the jointed arm assembly is located directly below, between the head assemblies. The Genmark® Gencobot robot is the standard robot with customized wrist and wand attachments. The Hine® robot (Figure 1-16 on page 1-31) is also available as a option.

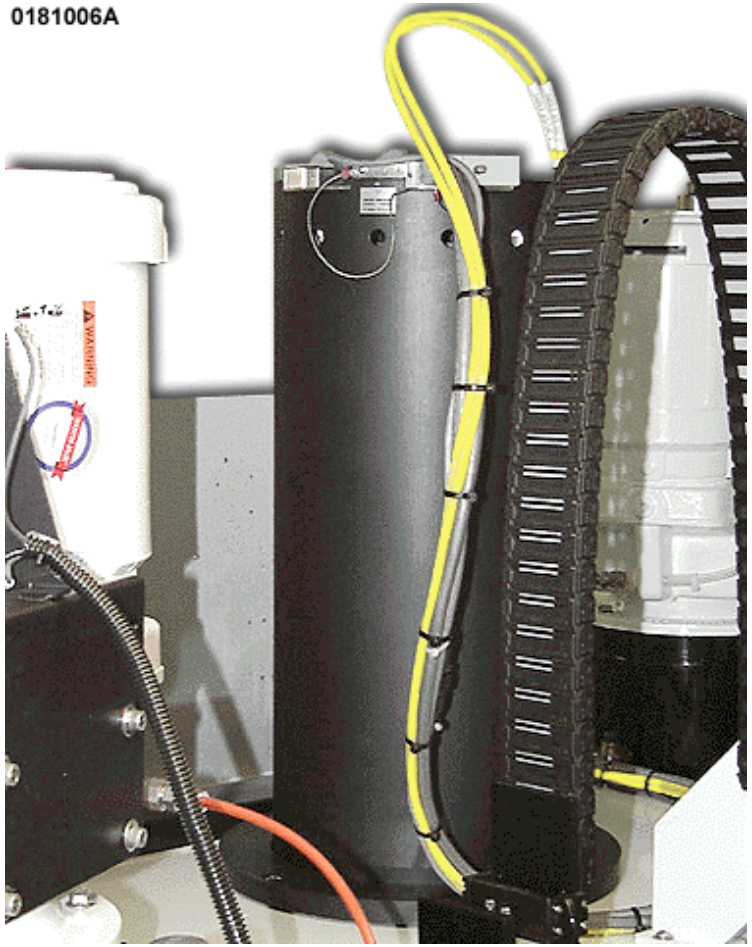


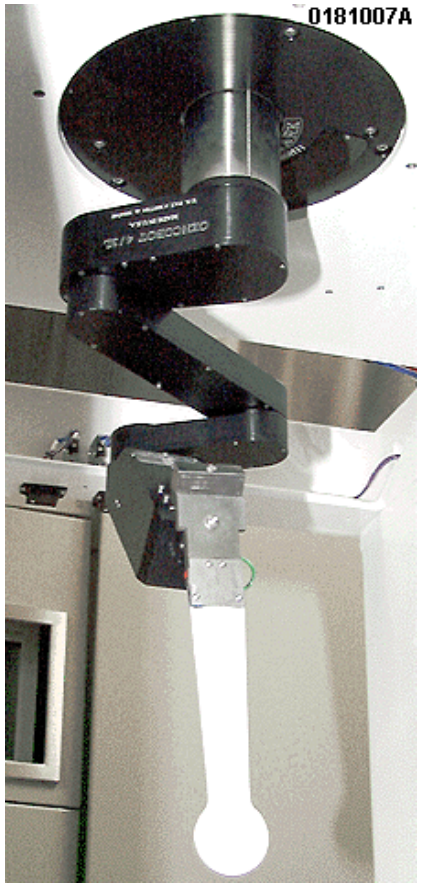
Figure 1-14. Gencobot Robot Body

Continued on next page

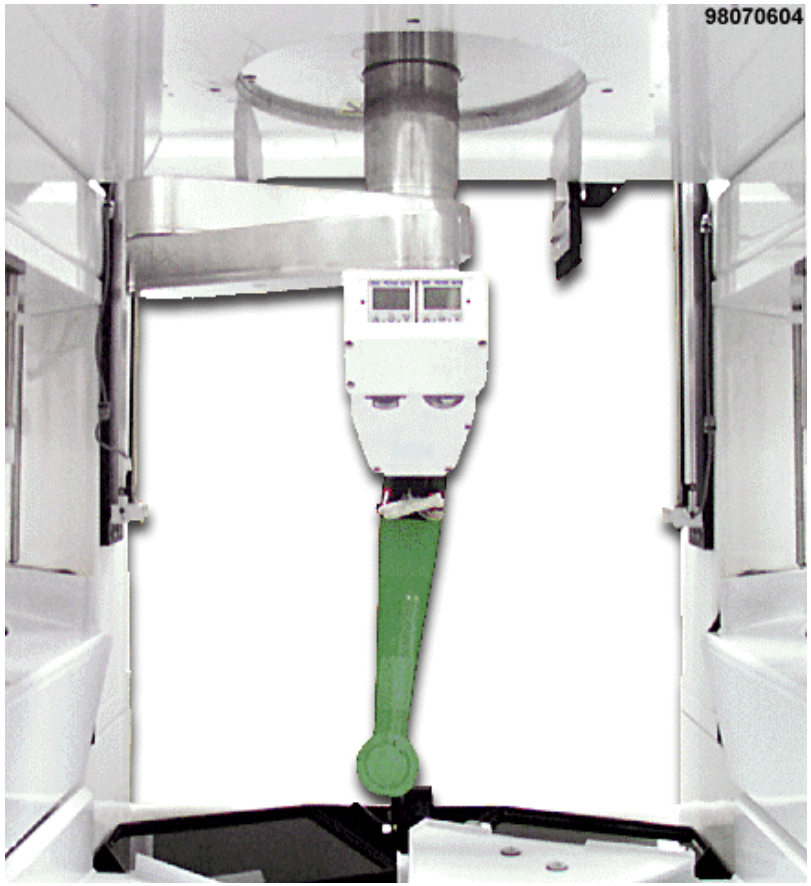
Gencobot Robot, continued

Link Arm Custom Wrist and Arm

At the end of the robot arm is the wafer “end-effector” or wand. This wand is the contact surface for all wafer handling procedures. Using a combination of vacuum and air pressure, the wand picks up, holds, and delivers wafers to the various process stations in the tool. Refer to Table 1-5 for the robot wafer handling steps in the polish process.



Gencobot Link Arm



Optional Hine® Link Arm

Figure 1-15. Link Arm Custom Wrist and Arm

Hine® Robot Option

Introduction

The optional Hine® Design 4.3CV robot uses throughput enhancement for faster wafer processing and reliability. It is responsible for all wafer movement in the tool and it is located in the center of the tool. The robot body extends above the top frame and the jointed arm assembly is located directly below, between the head assemblies. The Hine® robot (shown in Figure 1-16) is available as a option on the 676. Refer to Figure 1-14 on page 1-29 for the standard robot.

97070701

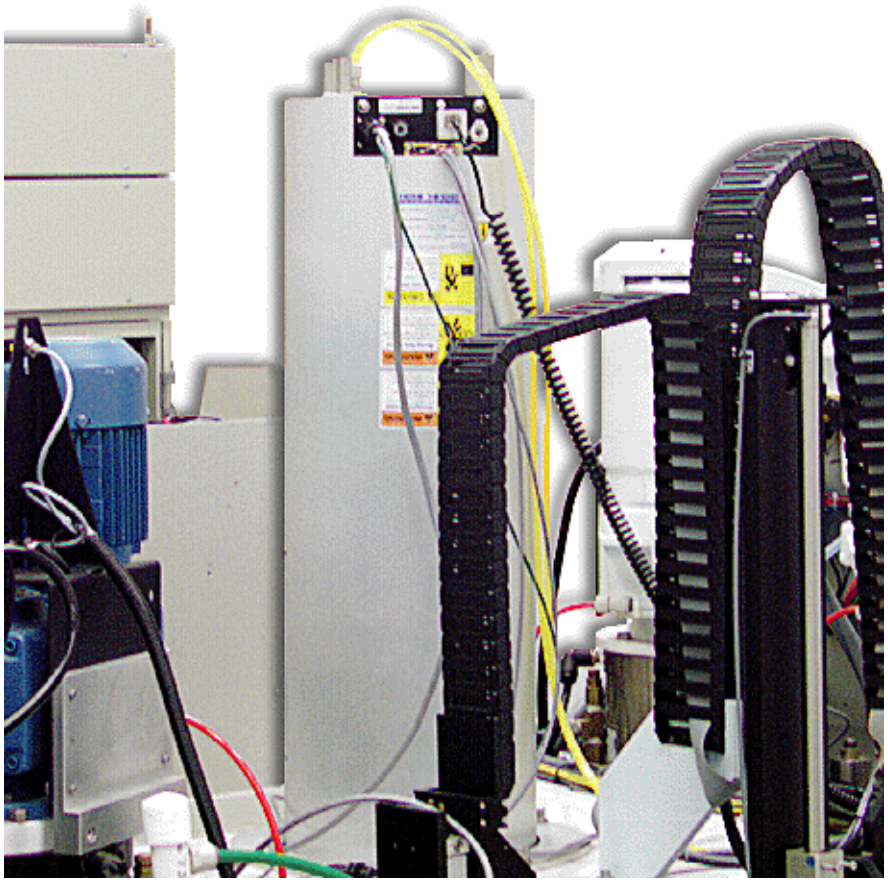


Figure 1-16. Hine® Robot Body

Continued on next page

Hine® Robot Option, continued

Robot Specifications

The Hine® robot is engineered for use in a chemically severe CMP environment. The Hine® robot incorporates a servo controlled flipper wrist that can access wafers in either the vertical or horizontal orientation. The design utilizes 416 stainless steel for the Z-axis spindle and arm links, and PET material for the wrist housing and end effector. The entire electronics package is incorporated in the base of the robot, no external control chassis is required beyond serial communication commands from the host computer. Refer to Table 1-4 for robot specifications.

Table 1-4. Robot Specifications

Item	Description
Radial Extension	The robot has a total radial reach of 28 inches from center of robot to end of wrist housing, (12 inches in negative direction.)
Z axis Extension	The robot has a maximum Z extension of 17 inches.
Theta Rotation	The robot is capable of a full 360° rotation.
Wrist Operation	The wrist operates with a servo controlled mechanism with an integrated fluid separator
Four Axis Controller	The entire electronic package and controller is located internally.
Pneumatics and Fittings	The vacuum lines are 1/8 inch ID and vacuum sense lines are 1/16 inch ID. All fittings are stainless steel, Teflon, nylon, or PET.
Software	The Hine® robot contains special custom macros to emulate the standard robot automation command subset used by the 676.
Power Requirements	The power requirements are 24VDC, 12A max.
Compliance	The Hine® robot meets all CE and S2 requirements.

Continued on next page

Hine® Robot Option, continued

Figure 1-17. Hine® Robot Teach Pendant and EMO Switch

Hine® Robot Option, continued

Safety Features

General Hine® robot safety information is contained in the Safety Information Chapter, Section 1.7, and other sections of the Hine® Design User's Manual, located in the Original Equipment Manufacturer (OEM) Manuals on the 676 CD-ROM in the Oem_manu.als\Hine subdirectory.

Teach Pendant

A teach pendant is supplied with the Hine® robot. The Teach pendant can be used for a number of tasks. Refer to Figure 1-17 on page 1-33. For more information on teaching the robot, refer to Chapter 3 of the Hine® Design User's Manual, located in the Original Equipment Manufacturer (OEM) Manuals on the 676 CD-ROM in the Oem_manu.als\Hine subdirectory.

EMO Switch

The teach pendant has an emergency stop motion button that can be used at any time to stop the motion of the robot. The button can be identified by the text "Emergency Stop" and is energized by a 24V power supply (supplied by SpeedFam-IPEC) to be used by the customer in emergency situations. Refer to Figure 1-17 on page 1-33.

Tool Points

Tool points can be taught on the Hine® robot, "Setting Hine® Robot Tool Points" on page 14-150 in the 676 Maintenance Manual.

Robot Operations

Robot Operations

Table 1-5. Robot Operations in a Typical Polish Cycle

Step	Instruction
1	Pick up a wafer from the wet cassette storage basin.
2	Position the wafer on the wand using alignment pins.
3	Place the wafer in the wafer head for polishing.
4	Remove the wafer from the polish head when polish is complete.
5	Place the wafer into the spray box for rinsing.
6	Remove the wafer from the spray box when finished.
7	Replace the wafer in its original slot in the wet cassette storage basin.

Pad Conditioning System

Location

The pad conditioning system consists of the head assembly, servo motor, and brush or diamond arm assembly. The two pad conditioners are located between the front and rear polish heads on the sides of the tool.

Figure 1-18. Pad Conditioning System

Continued on next page

Pad Conditioning System, continued

Purpose and Operation

The main function of the pad conditioners is to “rough up” or revitalize the pads after each polish cycle. They also rinse excess slurry and contaminants off the surface of the pads. Each conditioner consists of a controller unit on the high voltage panel, a head assembly attached to the top of the motor, and a brush or diamond arm assembly which contains the pad brush and DI water lines. Movement of each pad conditioner is directed by a controller unit inside the electrical cabinet on the high voltage panel.

After a polish cycle, when the wafer has been removed from the polish pad, the pad conditioner arm moves over the polish head, lowers on to the polish pad, and begins a series of side to side sweeps. This action “roughs up” the pad and rinses the contaminants away. After conditioning, the arm raises and rotates back to its home position.

Fluids System

Introduction

The fluids system consists of a complex network of supply and drain plumbing lines for DI water, slurry mixtures, and scrub exhaust. Virtually all tool systems are connected to the fluids system which is interwoven throughout the frame.

DI water is supplied to the tool from an external source. It is routed to the wet cassette assembly, the slurry module, the MP polish heads, and to the spray box assembly for various process uses. The Slurry System supplies a slurry (polishing chemical) mixture to each polish head slurry module during the wafer polishing process.

Slurry System

Introduction

The slurry system consists of the lines, filters, valves, and Slurry Modules which supply slurry mixtures to each polish head. Slurry enters the system from the lower chase side of the tool and flows through the slurry filters.

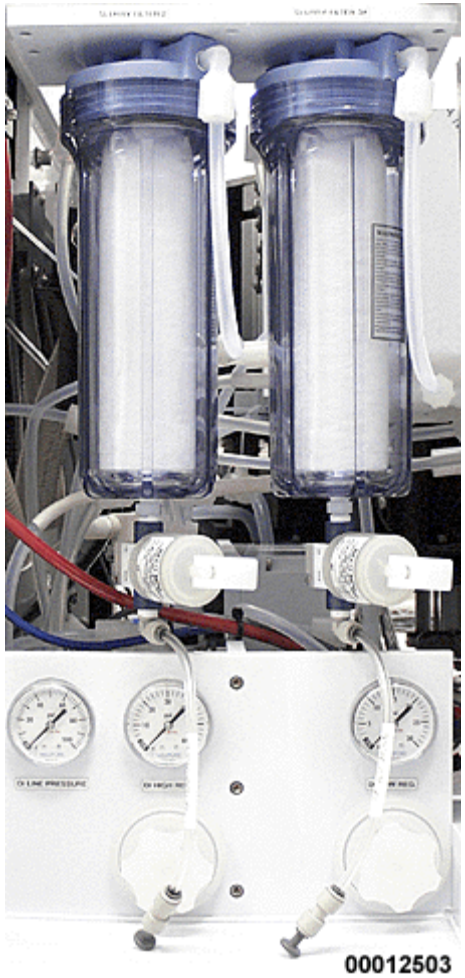


Figure 1-19. Slurry System Filters

Slurry Module

Purpose

After filtration, slurry is routed into each of the four slurry modules for distribution to the polish heads. A slurry module is located below each polish head on the sides of the tool, and consist of several pumps and valves for mixing and delivering fluid.

Location

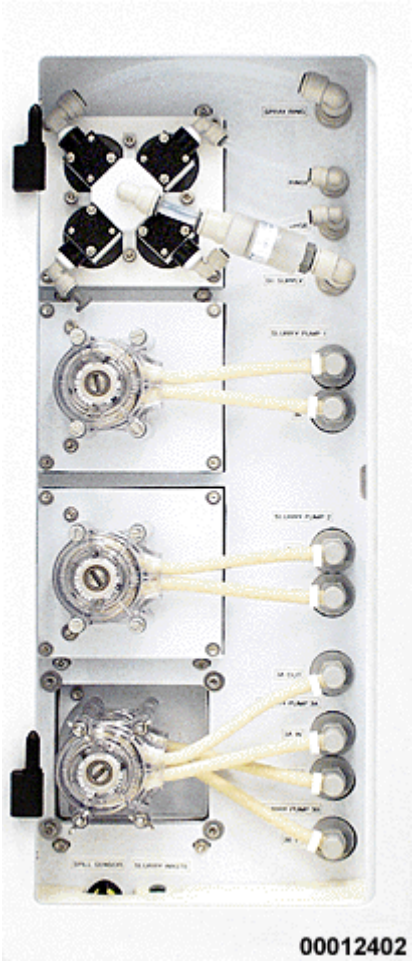


Figure 1-20. Typical Slurry Module

Continued on next page

Slurry Module, continued

Operation

After polishing, non-pressurized drainage lines move “processed” fluids out of each component and into either waste or recycle lines for removal from the tool. Software controlled diverter valves can use two separate recycle lines for later reclamation of slurry.

Two scrub exhaust systems evacuate exhaust air used by the pneumatic devices. The first system exhausts all pneumatic panel devices and any slurry fumes from the MP heads. The second (base exhaust) system evacuates the entire lower frame area of particles and fumes.

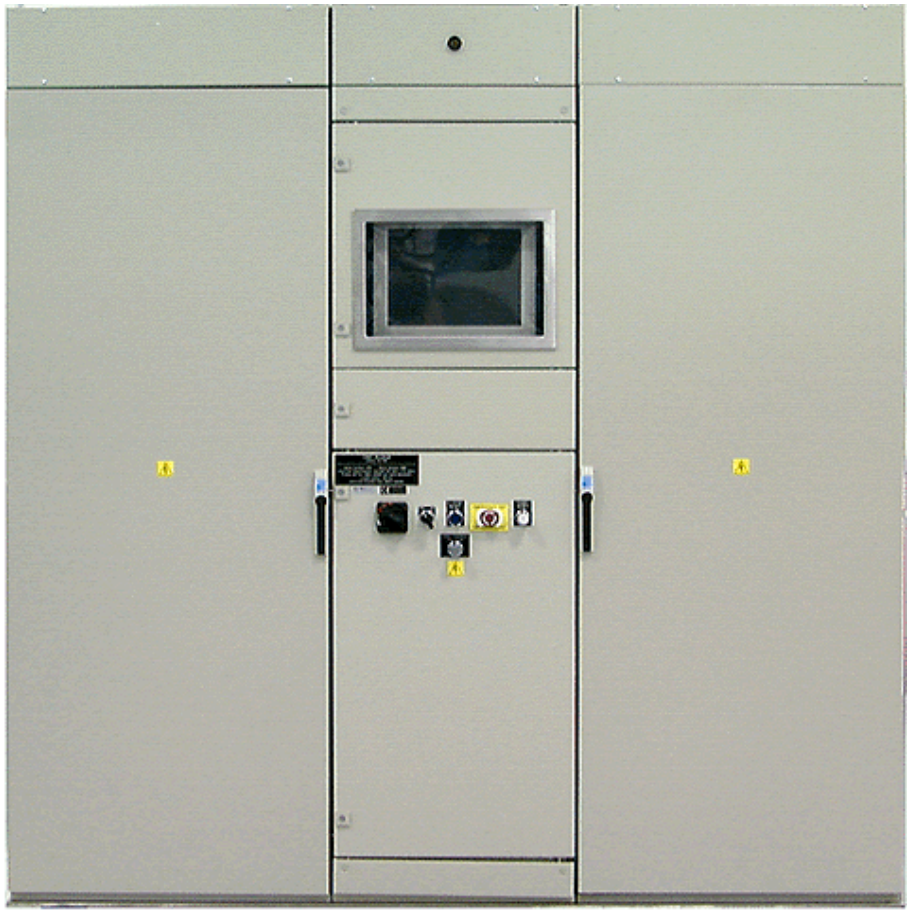
Features

The slurry modules have the ability to supply several different slurry mixtures to specific polish heads for custom processing. They also supply DI water for rinse and purge cycles which clean supply lines after polishing.

Electrical Cabinet

Location Electrical and logic control systems for the tool are located in the Electrical Cabinet.

Purpose The Electrical Cabinet contains the computer and logic control systems for all the MP systems. Electrical Cabinet components and assemblies are used to connect, convert, and distribute electrical power to other tool components.



Continued on next page

Electrical Cabinet, continued

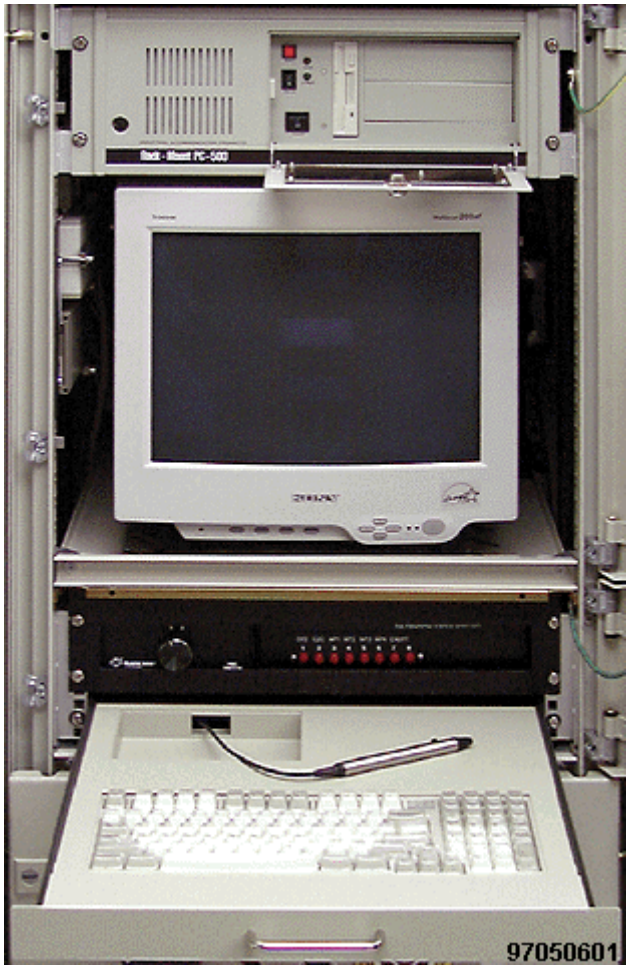


Figure 1-21. Electrical Cabinet Control Station

Continued on next page

Electrical Cabinet, continued

SysCon Computer

The system control (SysCon) computer is an industrial microcomputer which manages all computer control functions. It is located near the top of the center section of the electrical cabinet.

Connected to all other system computers through a network, the SysCon is the “server” which contains system software, disk storage, disk drive, and user interface resources. All tool operations controlled by the user are routed through the SysCon computer. The SysCon computer is programmed to delegate tasks to the other system computers, each with its own specialized functions.

Each of the tool systems are controlled by independent processing units linked through the SysCon computer for overall system control. Logic control systems and the low voltage and high voltage electrical panel assemblies are located in a separate electrical cabinet. The electrical cabinet is typically located on the chase (back) side of the tool. Sub-floor electrical, pneumatic, and plumbing lines connect the tool, electrical cabinet, and facility resources.

Electrical Cabinet Control Station

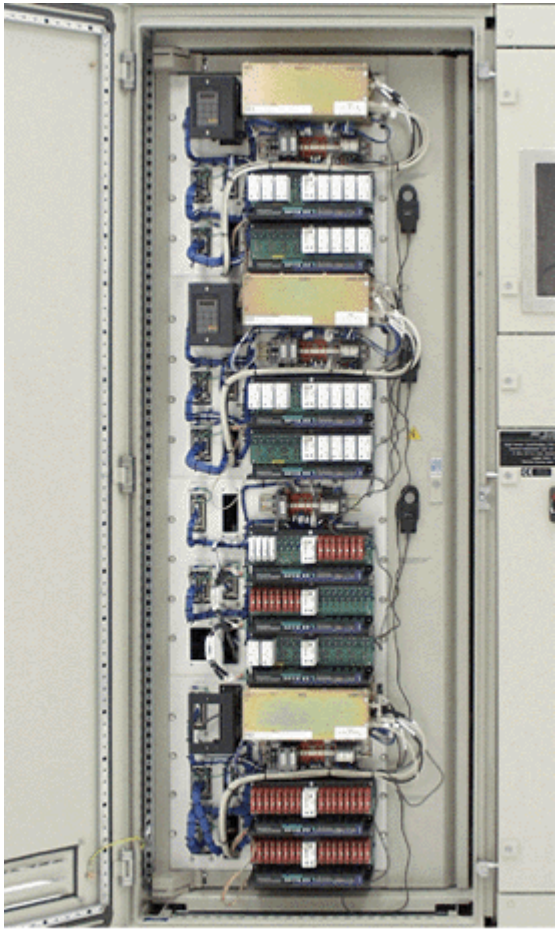
A control station, used primarily for diagnostic or maintenance work, is located directly below the SysCon computer in the middle section of the electrical cabinet. It consists of a monitor, keyboard, light-pen, and a switch box for monitoring the displays of the other system computers.

This control station, like the primary operator control station on the front side of the tool, can be used to operate the tool. However, it is not the primary station for tool operation. Because it gives direct access to the SysCon computer, as well as keyboard control and a switch box for monitoring the displays of all other system computers, this station is used primarily for system diagnostics, certain maintenance procedures, and by the manufacturer for programming access.

ServSwitch

The ServSwitch system replaces the standard keyboard/video switch box and allows the operator to use one mouse to control all six stations while in Service Mode. The standard configuration keyboard/video switch box requires maintenance personnel to use a separate mouse for each station, such as MP1, MP2, etc.

Electrical Cabinet, continued



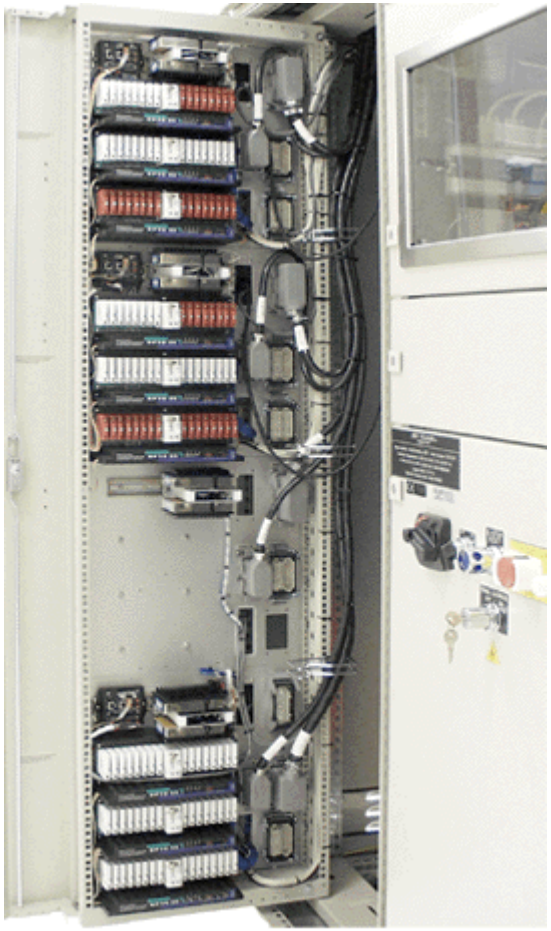


Figure 1-22. Typical Electrical Cabinet Low Voltage Swing Panels

Continued on next page

Electrical Cabinet, continued

MP Panels

MP panels contain the logic control hardware for each MP module. Low voltage panels contain an MP computer, local stop relay, spindle enable relay, , 2 analog I/O rails, and 3 digital I/O rails.

The MP computers are networked to the SysCon computer. These computers control the wafer and polish head processes for each MP.

High voltage panel components control wafer and polish head motor revolution speed as well as pump speeds in each slurry module. These panels contain a variable-frequency drive, three DC motor controllers, a slurry enable relay, a three-pole contactor, and two three-pole AC motor overload protectors.

Pad Conditioner Panels

Pad conditioner low voltage panels supply the input and output signals needed to control and receive feedback from the pad conditioners. The panel contains a local stop relay and three racks of I/O. The I/O on this rack is controlled by the C2C computer which is located on the C2C low voltage panel.

The pad conditioner high voltage panels contain the controllers which are the controlling unit for each pad conditioner system. There are two pad conditioner high voltage panels on the tool.

Continued on next page

Electrical Cabinet, continued

C2C Panels

The C2C low voltage panel contains the C2C computer, a local stop relay, the sensor array relay, and five racks of digital I/O. There is one C2C low voltage panel on the tool.

The C2C computer is networked to the SysCon computer. It is mounted on the C2C panel on the left hand side of the electrical cabinet. The C2C computer directs the actions of all cassette to cassette systems as well as the non-polish process stations.

Control signals are routed through the C2C panel to cause the movement of each component. These processes are coordinated with all other system functions by the SysCon computer.

The robot controller is located on the C2C high voltage panel. Its single function is to supply logic control for the robot system through a 25 ft. (7,6 M) cable that connects the robot to the controller. There is one C2C high voltage panel on the tool.

Main Power Panel

The main power panel contains the AC and DC power conversion and distribution components which supply electrical power to all tool systems. The main power panel on the tool is located in the lower-center section of the electrical cabinet. The panel includes a three-pole main circuit breaker, an EMO contactor, a parallel transient voltage surge suppressor, an isolation transformer, and 24V, 12V, -12v, and 5V power supplies.

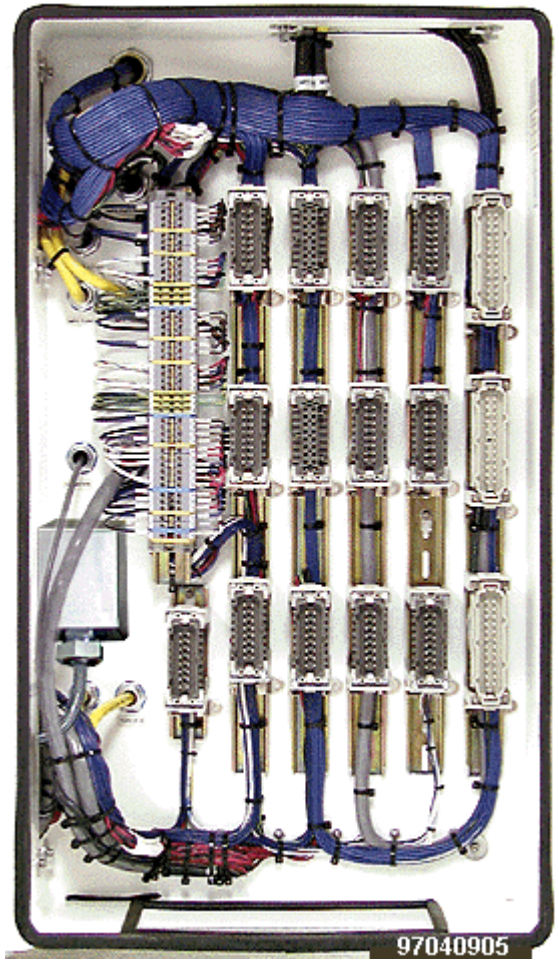
Interconnect Boxes

Interconnect Boxes

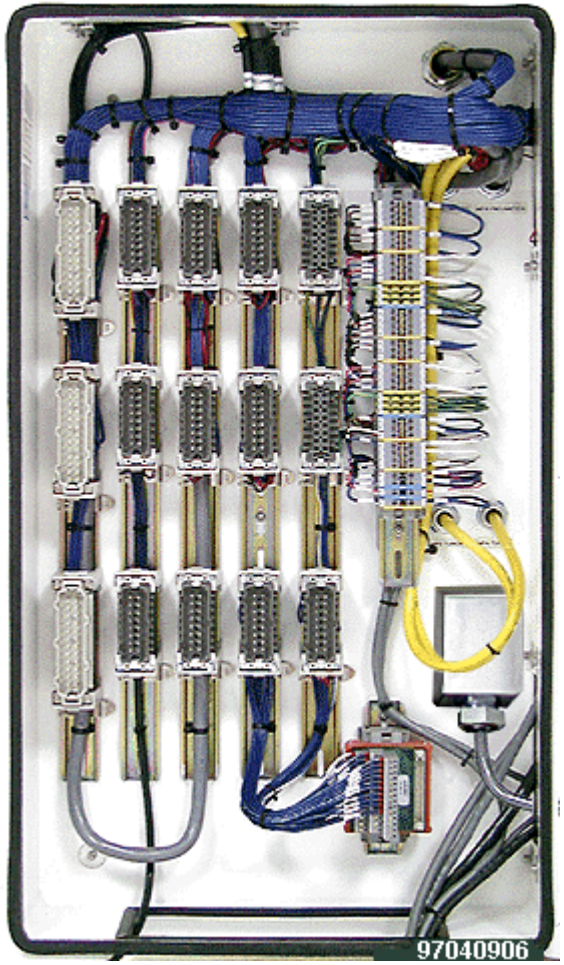
The two interconnect boxes are located on the lower chase side of the Main Tool. The interconnect boxes are used to connect the electrical cabinet components to the electrical components on the Main Tool. Power distribution and I/O connection lines are routed from the electrical cabinet into the tool through the interconnect boxes. The interconnect box on the left contains the connections to MP 3 and 4, pad conditioner 2, the robot, and the wafer sensor arrays. The interconnect box on the right contains the connections to MP 1 and 2, pad conditioner 1, and the spray box and wet cassette. Refer to Figure 1-23 on page 1-49.

Continued on next page

Interconnect Boxes, continued



Left Side



Right Side

Figure 1-23. Interconnect Boxes

Brookside® Endpoint Detection System

Purpose

The Brookside® End Point (EP) detection system for Tungsten (W) polish uses a dedicated computer to monitor relative friction during the polishing process. The relative friction of the pad moving across a W surface in the presence of slurry is lower than that for a TiN surface. By monitoring motor current, a change in relative friction detects the W endpoint. Optional endpoint detection systems are available for Oxide polishing. More information is available about the Brookside® Endpoint Detection System in the Original Equipment Manufacturer (OEM) Manuals on the 676 CD-ROM in the Oem_manu.als\Brookside subdirectory.

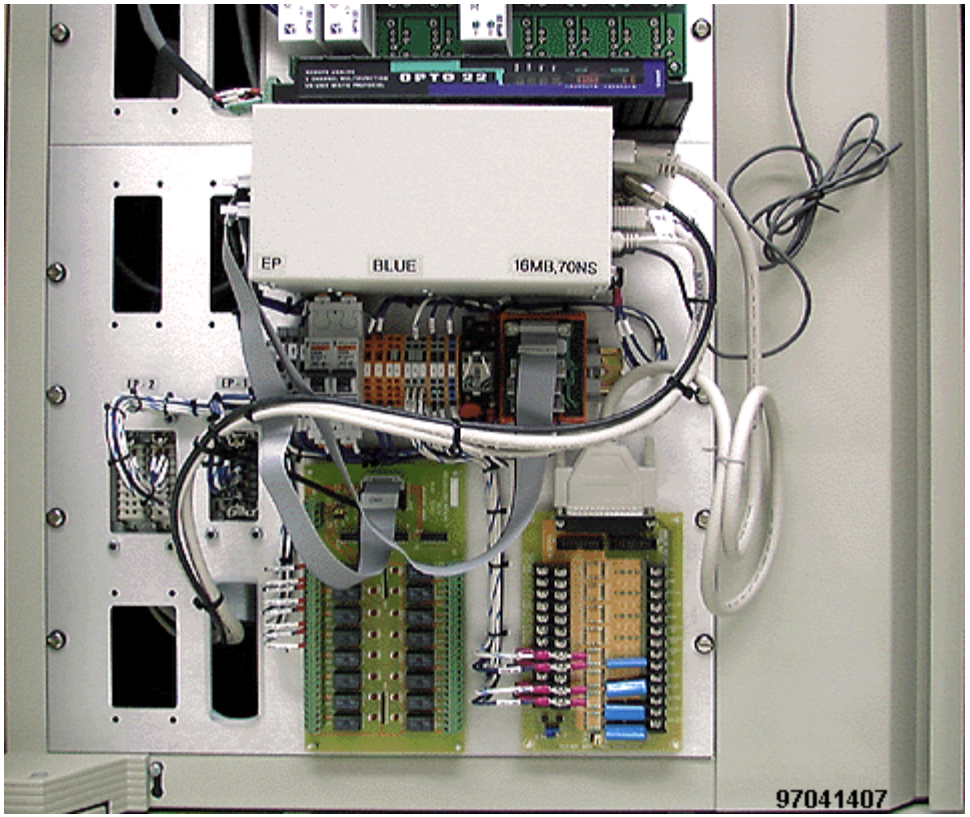


Figure 1-24. Typical End Point Computer Panel Assembly

Filmetrics® Endpoint Detection System

Purpose

The optional Filmetrics® (F76) Endpoint Detection system is an optical endpoint system for chemical mechanical polishing (CMP) applications. The F76 measures the reflection spectrum from the surface of the wafer as it is being polished. Analysis of successive reflection spectra permits determination of the process endpoint and independent monitoring of all four polishing heads simultaneously.

Process Application

The primary process application of the F76 system is Tungsten (W). Future applications which may become available through software and hardware upgrades include copper and oxide polishing.

Luxtron Endpoint Detection System

Introduction

The optional Luxtron Endpoint (EP) detection system stops the polishing process by detecting complete removal of the current process layer. The system uses a dedicated computer to monitor relative friction during the polishing process. The relative friction of the pad moving across an X surface in the presence of slurry is different than that for a Y surface. By monitoring motor current, a change in relative friction detects the X endpoint. The system is located in the Electrical Cabinet.

Figure 1-25. Luxtron Endpoint Detection Display

Tool Operation

Introduction

The tool is typically run from the control station on the front (operator) side of the tool. The operator uses a light pen and monitor to interact with system software and control system functions. Diagnostic and maintenance procedures can be controlled at a similar station on the Electrical Cabinet. The Electrical Cabinet control station has both a light pen and keyboard interface.

Wafer Loading

The wafer polishing process begins when the operator loads a wafer cassette into the wet cassette loading arm. Wafer cassettes can be loaded by hand or by an automated handling system. After loading the wafer cassettes, the operator door closes, isolating the operator from the polishing process.

Wafer Polishing

The operator selects a polishing recipe, then selects Process from the Carriers dialog box. The operator uses the control station monitor to control the polishing process by making the appropriate menu selections with the light pen. The tool then processes all wafers in the wafer cassette. Table 1-6 gives the steps in a routine polish process.

Table 1-6. Routine Polish Process For Each Individual Wafer

Step	Instruction
1	The robot receives request for a wafer from a MP polish head.
2	The robot picks a wafer (on the device side) from a wafer cassette, aligns it against the alignment pins, then loads the wafer into a wafer head.
3	Wafer head vacuum comes on. When the sensor “sees” the wafer, it signals the computer and the robot will receive a signal to release the wafer and move to a safe area.
4	The wafer head lowers to the polish head. Wafer vacuum is turned off.
5	The polish process begins. The wafer head rotates while the polish head orbits, slurry and DI water are introduced between the two heads, and pressures are applied, causing Chemical Mechanical Planarization (CMP).

Continued on next page

Tool Operation, continued

Step	Instruction
6	When the polish cycle is over, the wafer head will turn on wafer air and raise, leaving the wafer, device side down, on the polish pad.
7	If there is another wafer to be polished, the robot will load it, then move down to pick up the wafer on the polish pad.
8	Pad air will come on to break the surface tension between the polish pad and the wafer, allowing the robot to pick up the polished wafer.
9	The robot will then place the polished wafer in the spray box to be rinsed.
10	When the spray box cycle is completed, the robot will pick up the rinsed wafer and return it to its original position in the wafer cassette.

Chapter 2

Site Preparation and Specifications

Contents This chapter contains the following topics:

Topic	See Page
Site Preparation	2-2
Tool Dimensions	2-3
Facility Requirements	2-4
Fluid Connections	2-6
Environmental Requirements	2-8
Exhaust Requirements	2-9

Site Preparation

Introduction This chapter gives information about facility preparation requirements. These preparations will make sure the facility is ready for tool delivery and production.

Tool Dimensions

Introduction

This section gives information about the size and dimensions of the tool. Use this information when moving and installing the tool. This information should also be referenced when preparing the site for production and maintenance of the tool. The Main Tool and Electrical Cabinet are disassembled and packaged into three crates so they can be shipped easily. Refer to Table 4-1, “Shipping Crate Checklist,” on page 4-3 for information about the contents of each crate. Before the tool is cleaned and packaged, all tool components and assemblies must pass an detailed inspection by SpeedFam-IPEC Quality Assurance.

Dimensions

Table 2-1 lists the outside dimensions of the Main Tool and the Electrical Cabinet. Refer to Figure 1-1 on page 1-10 and Figure 1-2 on page 1-11 for typical exterior views of the Main Tool and Electrical Cabinet.

Table 2-1. Tool Dimensions

EQUIPMENT	Height	Width	Depth
Main Tool (without Hoist)	96" (243.8 cm)	82" (208.3 cm)	69" (175.3 cm)
Main Tool (with Hine Robot Option)	102” (289.5 cm)	82" (208.3 cm)	69" (175.3 cm)
Main Tool (with Hoist Option)	108” (274.3 cm)	82" (208.3 cm)	69" (175.3 cm)
Main Tool - Center of gravity	47.5” (120.7 cm)	38” (96.5 cm)	24.5” (60.9 cm)
Electrical Cabinet	88” (223.5 cm)	88” (223.5 cm)	24” (61.0 cm)
Electrical Cabinet - Center of gravity	40” (101.6 cm)	44” (111.8 cm)	14” (35.6 cm)

MAINTENANCE CLEARANCE	Total Height	Chase Side	Left/Right	Back Side
Maintenance Clearance - Main Tool (with Hoist Extended)	126” (320 cm)	40” (101.6 cm)	20” (50.8 cm)	N/A
Maintenance Clearance - Electrical Cabinet	96” (243.8 cm)	40” (101.6 cm)	N/A	40” (101.6 cm)

Facility Requirements

Introduction

Installation of the AvantGaard™ 676 requires that the size, cleanliness, and capacity of the facility site is appropriate for wafer handling cleanroom equipment. The tool has two major assemblies, the Main Tool and the Electrical Cabinet. The Main Tool mounts flush into a bay chase wall. The Electrical Cabinet can be located directly behind the tool (minimum clearance 36 inches, 91.4 cm).

Figure 2-1. Typical Tool Installation

Continued on next page

Facility Requirements, continued

Weight

The weight of the complete Main Tool, including exterior panels, is approximately 6500 pounds (2,948 kg). The weight is evenly distributed with each of the four leveling feet supporting approximately 1625 pounds (737.1 kg). The weight of the Electrical Cabinet is approximately 3500 pounds (1587.6 kg). Reinforced flooring is recommended for this cabinet.

Both the Main Tool and the Electrical Cabinet should be mounted on customer supplied pedestals that position the hard mount connections at floor level. Pedestal design may vary from site to site due to Engineering requirements.

Cleanroom Preparation

When the tool is installed, the cleanroom wall must be temporarily removed to allow the tool to be properly positioned. The installation process includes removing the existing wall, and erecting a temporary wall. This will allow the tool to be easily moved. An additional 4 to 6 inches (10.1 to 15.2 cm) above the maximum tool height is required during installation to allow for skids and wheels.

Electrical Requirements

Tool electrical power requirements are 208VAC, 60 Hz, 60 Amps, 3 phase WYE with a common and ground, and #2, copper THHN 90°C, derate ground to #8 copper, 1-1/4 inches conduit. The AIC rating for the main breaker on the tool is 65,000 Amps. The facility disconnect must be visible from the tool, or capable of being locked in the OFF (open) position.

[S/N 3076, 3078, 3084, 3088] The AIC rating for the main breaker on the tool is 10,000 Amps.

Mechanical Requirements

The tool is mounted through the bay wall, with the mounting plane flush with the wall. Frame the facia on the sides and bottom with a 4 inch (10.1 cm) wide stainless-steel trim strip that extends out 1 inch (2.54 cm) on the sides and 1.5 inch (3.81 cm) from the floor. The facia will be 76 inches (193.0 cm) wide and 84 inches (213.4 cm) tall. Make sure the metal portion of Fab does not contact the Main Tool.

DI Facility Requirements

There must be an exterior shut-off on the facility DI water supply line that can be used in case of emergency.

Scrub Sensor

The scrub exhaust sensors should be connected with 2# 16 AWG copper THHN 75°C or better, 1/2 inch (1.27 cm) conduit.

Fluid Connections

Introduction The tool fluid connections are located on the lower chase side of the Main Tool. Facility fluid supply lines must be positioned correctly to connect with the fluids connections on the tool. Refer to Table 2-2 for the specifications for the typical facility fluids connections. Use the information in Figure 2-2 to assist in the layout of the facility fluid services that will be connected to the installed tool.

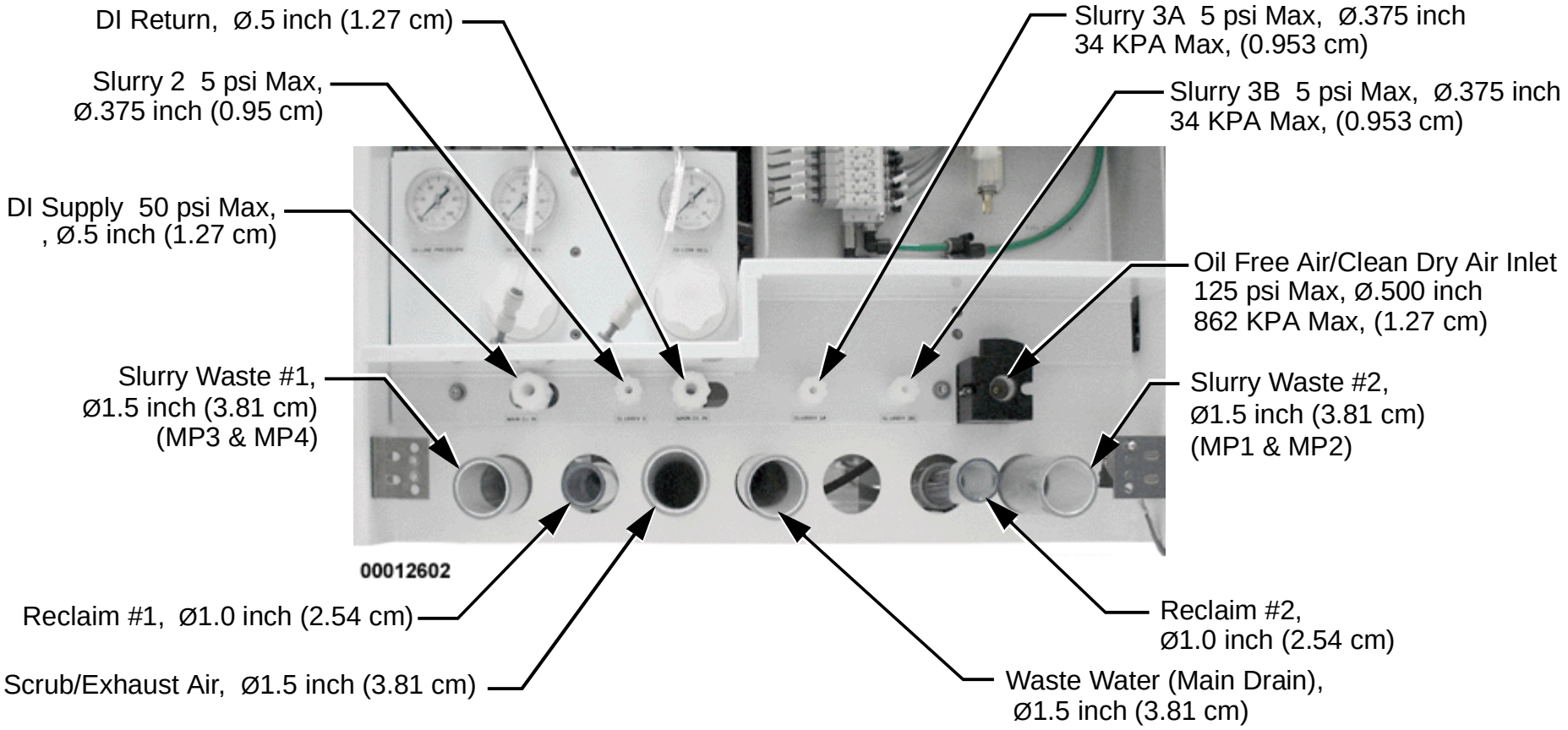

DI Return, Ø.5 inch (1.27 cm)
Slurry 2 5 psi Max, Ø.375 inch (0.95 cm)
DI Supply 50 psi Max, , Ø.5 inch (1.27 cm)
Slurry Waste #1, Ø1.5 inch (3.81 cm) (MP3 & MP4)
Reclaim #1, Ø1.0 inch (2.54 cm)
Scrub/Exhaust Air, Ø1.5 inch (3.81 cm)
Slurry 3A 5 psi Max, Ø.375 inch 34 KPA Max, (0.953 cm)
Slurry 3B 5 psi Max, Ø.375 inch 34 KPA Max, (0.953 cm)
Oil Free Air/Clean Dry Air Inlet 125 psi Max, Ø.500 inch 862 KPA Max, (1.27 cm)
Slurry Waste #2, Ø1.5 inch (3.81 cm) (MP1 & MP2)
Reclaim #2, Ø1.0 inch (2.54 cm)
Waste Water (Main Drain), Ø1.5 inch (3.81 cm)
00012602

Figure 2-2. Main Tool Fluids Connections

Continued on next page

Fluid Connections, continued

Main Tool Fluids Specifications

Table 2-2 gives the specifications for the typical facility fluids connections. Refer to Figure 2-2 to assist in the layout of the facility fluid services that will be connected to the installed tool. All utilities connected to the tool must be clearly and permanently labeled as to their contents and function.

Table 2-2. Main Tool Fluids Connections and Specifications

Input / Output	Connection Size/type	Pressure	Flow	Confirmed (Date And Initial)
DI Return	1/2” (1.27 cm) flaregrip	50 psi (345 KPA)	0-5 gpm (0 - 19 LPM) max.	
Slurry 2	3/8” (0.95 cm)	5 psi (34.5 KPA)	0.5 gpm (1.9 LPM)	
DI Supply	1/2” (1.27 cm) flaregrip	50 psi (345 KPA)	0 - 5 gpm (0 - 19 LPM)	
Slurry Waste #1	1 1/2” (3.81 cm)		2 gpm (7.6 LPM)	
Reclaim #1	1” (2.54 cm)		1 gpm (3.8 LPM)	
Scrub	1 1/2” (3.81 cm)	1.0” - 4.0” H_20	50 scfm (1416 L/Min)	
Waste Water	1 1/2” (3.81 cm)		5 gpm (19 LPM) max	
Reclaim #2	1” (2.54 cm)		1 gpm (3.8 LPM)	
Slurry Waste #2	1 1/2” (3.81 cm)		2 gpm (7.6 LPM)	
OFA	1/2” NPT (1.27 cm)	90 - 125 psi (621 - 862 KPA)	18 scfm (510 L/Min)	
Slurry 3b	3/8” (0.95 cm)	5 psi (34.5 KPA)	0.5 gpm (1.9 LPM)	
Slurry 3a	3/8” (0.95 cm)	5 psi (34.5 KPA)	0.5 gpm (1.9 LPM)	
Base Drain (To CDS)	3/4” (1.9 cm)		1 gpm (3.8 LPM)	
Base Scrub	6” (15.24 cm)	2.0” - 4.0” H_20	300 scfm (8495 L/Min)	

Environmental Requirements

Tool Requirements

Table 2-3 gives the facility environmental requirements for the typical tool installation.

Table 2-3. 676 Environmental Requirements

Environment Condition	Requirement
Ambient Operating Temperature	50°F (10°C) minimum to 85°F (32°C) maximum
Relative Humidity During Operation	20% minimum and 60% maximum relative humidity (non-condensing) at 77°F (25°C)
Atmospheric Contamination	Class 100 cleanroom or better
Storage and Shipping Temperature	45°F (7°C) minimum to 122°F (50°C) maximum
Relative Humidity During Storage and Shipping	10% minimum and 90% maximum relative humidity (non-condensing) at 77°F (25°C)
Idle Temperature	45°F (7°C) minimum to 122°F (50°C) maximum
Relative Humidity at Idle	10% minimum and 90% maximum relative humidity (non-condensing) at 77°F (25°C)
Altitude	Recalibration for differences in atmospheric pressure may be required. Contact SpeedFam-IPEC Field Engineer.

Exhaust Requirements

Requirements

Table 2-4 gives the exhaust requirements for the AvantGaard™ 676. Refer to Figure 2-2 for Main Tool Fluids Connections. SpeedFam-IPEC recommends that a Photohelic alarm is used to indicate if scrub exhaust failure occurs.

Table 2-4. Exhaust Requirements

Component	Requirement
Air Exhaust Ducts	Nonmetallic fire rated material suitable for water vapor containing acid or bases.
Liquid Exhaust Pipe	Schedule 40, or greater, clear PVC or other cleanroom compatible nonmetallic fire rated material. All liquid exhausts shall be fire rated and suitable for acids or bases.
Liquid Exhaust Tubing	Flexible Teflon or other cleanroom compatible material.
All Pneumatics, Vacuum Generators, and Polish Heads	Exhaust with 1.5 inch scrub line.

NOTE: **Tool exhaust measurements should be made 4 to 5 duct diameters from the first elbow or junction outside of the tool.**

Notes:

Chapter 3

Safety Hazards and Precautions

Contents This chapter contains the following topics:

Topic	See Page
Overview	3-2
Consequences of Safety Violations	3-5
Danger, Warning, Caution, and Note Icons	3-6
Emergency OFF (EMO) Circuit	3-15
System Interlocks	3-21
Alarm Messages	3-26
Mechanical Hazards	3-29
Electrical Hazards	3-44
Chemical Hazards	3-73
Material Safety Data Sheets	3-83
Cleaning and Spills	3-85
Airborne Noise Hazards	3-88
General Hazards	3-90
Laser Hazards	3-92
S2-93 and CE Compliance	3-93
Moving the Tool	3-94

Overview

Introduction

The safety of the AvantGaard™ 676 operator is extremely important to SpeedFam-IPEC. The Tool was designed to minimize operator exposure, but hazards are inherent with any complex machinery. In this chapter, potential safety hazards are identified and discussed. Recommendations for the safe use of this equipment are given here as well as in the troubleshooting and maintenance chapters. **Please read this chapter thoroughly.**

Functional Safety Hazards

The AvantGaard™ 676 is a highly automated, electro-pneumatic, mechanical wafer polisher that is designed with many safety features. All electromechanical machinery have various safety precautions that must be observed by the operator to make sure the polisher is operated safely.

Functional safety hazards are those present during normal operation of the Tool. These safety hazards are present due to the electrical, mechanical, chemical, and thermal operating characteristics of the Tool. These specific safety hazards and associated precautions are detailed in the following sections.

General Operational Safety Hazards

Other safety hazards may be present, including safety hazards due to sharp objects, broken wafers, or pinch points. These general operational safety hazards require safety precautions that must be observed by the operator at all times.

Lockout Feature

The Tool is equipped with a lockout feature on the main disconnect switch on the Electrical Cabinet. The lockout feature is a lockout tab in the center of the switch. The tab is used to padlock the switch in the OFF position. Use the lockout feature of the main disconnect switch when Tool electrical power is OFF. Locking out the handle will make sure power cannot be applied, and increases personal safety until the lockout is removed.

continued on next page

Overview, continued

Tool Status

Proper personnel notification procedures should be used to identify Tool status. Facility tagout procedures should be used to give personnel rapid status identification of the Tool. Tagout procedures consist of status tags positioned in a suitable location for rapid status recognition. They give an added measure of safety.

S2-93 / IEC Compliance

The Tool described in this manual is S2-93 and IEC compliant. S2-93 safety guidelines are intended as a minimum set of performance based environmental, health and safety considerations for equipment used in semiconductor manufacturing. These guidelines are produced by SEMI, a semiconductor manufacturer consortium that sets safety standards, similar to UL listings for consumer electronics.

[S/N 3031] This Tool was originally built with white colored neutral power wires in some locations. To comply with applicable CE regulations, these locations now have light blue heat shrink tubing, with a "NEU" label, to endmark the white neutral power wires. This Tool was originally built with solid green colored earth ground wires in some locations. To comply with applicable CE regulations, these locations now have GRN/YEL bicolor heat shrink tubing to endmark the green earth ground wires.

continued on next page

Overview, continued

Personal Protective Equipment (PPE)

The Tool is designed to be used in a Class 1 cleanroom environment. Under normal conditions, Tool operators and maintenance personnel do not require additional protective clothing or equipment other than that which is prescribed for working in the specified cleanroom environment.

Typical Class 1 cleanroom clothing requirements include a full body suit, which covers all parts of the body including the feet and head. Requirements also specify that gloves and protective glasses be worn at all times. Operators should follow all operation and maintenance specifications indicated on site.

Site Specific Safety Check

After the Main Tool and Electrical Cabinet have been properly installed, and all facilities and electrical connections have been made, site specific safety criteria should be checked before allowing personnel to work with the Tool.

EHS Analysis

SpeedFam-IPEC is committed to the highest level of safety for all personnel. The AvantGaard™ 676 has been subjected to a comprehensive Environmental Health and Safety (EHS) analysis. This analysis was completed to identify and eliminate hazards to personnel installing, operating, or maintaining the equipment.

Site Specific Safety Check

After the Main Tool and Electrical Cabinet have been properly installed, and all facilities and electrical connections have been made, site specific safety criteria should be checked before allowing personnel to work with the Tool.

Consequences of Safety Violations

Introduction Safety guidelines and procedures exist for the protection of all personnel associated with the operation or maintenance of the AvantGaard™ 676. The mechanical, electrical, and chemical hazards associated with this Tool have significant destructive potential.

Personal Injury Personal injury is the most important safety concern. The potential for serious and even life-threatening injury exists if safety mechanisms and procedures are ignored or purposely overridden. Under no circumstances should an operator disable safety circuits, interlock mechanisms, or safety shields.

Product Damage Product damage can result from modified, unsafe, or careless Tool operation. Wafers represent an enormous investment of time, technological resources, and money. Operating the Tool in an unsafe condition or in an unauthorized manner can damage or destroy wafers.

Tool Damage Damage to sensitive Tool components and assemblies, including the robot arm, wafer sensors, operator access doors, and other systems can happen during modified, unsafe, or operating and maintenance procedures that are not approved.

Facility Damage Facility electrical disruption, fluid discharge, or system contamination could result from failure to follow specified maintenance and operational procedures.

Training Because safety of the AvantGaard™ 676 Operator and Maintenance personnel is extremely important to SpeedFam-IPEC, formal training offered by SpeedFam-IPEC is essential to maintain a high level of safety. Please contact the SpeedFam-IPEC Training Department at (480) 785-4473 to arrange training for any personnel operating the AvantGaard™ 676.

Danger, Warning, Caution, and Note Icons

Definitions

To emphasize and to make clear the importance of Danger, Warnings, Cautions, and Note icons in the manual and on the AvantGaard™ 676, the definitions and formats shown on the following pages are used. If you do not pay attention to them, and the safety information they contain, you can be injured, lose your life, or damage the product or the Tool.

In the AvantGaard™ 676 manuals, all Dangers, Warnings, and Cautions are located directly above the text to which they apply, and Notes are located directly below the text to which they apply. Refer to page 3-7 for descriptions.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

DANGER - THESE SYMBOLS ARE USED IN THE MANUAL, AND ON LABELS IN THE TOOL, TO ALERT THE USER TO THE PRESENCE OF DANGEROUS VOLTAGE, WITHOUT INSULATION, IN THE MACHINE'S ENCLOSURE(S). PERSONAL INJURY OR LOSS OF LIFE WILL RESULT IF PROPER OPERATING PROCEDURES, PRACTICES, ETC. ARE NOT CORRECTLY FOLLOWED.

DANGER - CES SYMBOLES SONT UTILISÉS DANS LE MANUEL ET SUR LES ÉTIQUETTES DE LA MACHINE, POUR METTRE L'UTILISATEUR EN GARDE CONTRE LA PRÉSENCE DE VOLTAGE DANGEREUX, SANS ISOLANT, À L'INTÉRIEUR DES ENCEINTES DE LA MACHINE. SI VOUS NE SUIVEZ PAS CORRECTEMENT LES PROCÉDURES ET LES MÉTHODES D'UTILISATION, VOUS RISQUEZ DES BLESSURES OU LA MORT.

GEFAHR - DIESE IM HANDBUCH UND AUF DEN WERKZEUGSCHILDERN VERWENDETEN SYMBOLE WEISEN DEN BENUTZER DARAUF HIN, DAß IM GEHÄUSE BZW. IN DEN GEHÄUSEN DER MASCHINE EINE GEFÄHRLICHE, NICHT ISOLIERTE SPANNUNG VORLIEGT. EINE NICHTBEFOLGUNG DER ORDNUNGSGEMÄßEN BEDIENUNGSVORSCHRIFTEN, -VERFAHREN, USW. KANN KÖRPERVERLETZUNGEN ODER DEN TOD VERURSACHEN.

ОПАСНОСТЬ - Эти символы используются в Руководстве и на табличках в установке для того, чтобы предупредить пользователя о наличии опасного напряжения на неизолированных элементах внутри кожухов установки. Если не применять надлежащие режимы и методы работы, это может привести к травмам или несчастным случаям со смертельным исходом.

Danger, Warning, Caution, and Note Icons, continued

WARNING - THESE SYMBOLS ARE USED IN THE MANUAL, AND ON LABELS IN THE TOOL, TO ALERT THE USER TO THE PRESENCE OF PINCHING AND CRUSHING HAZARDS. PERSONAL INJURY OR LOSS OF LIFE CAN RESULT IF PROPER OPERATING PROCEDURES, PRACTICES, ETC. ARE NOT CORRECTLY FOLLOWED.

AVERTISSEMENT - CES SYMBOLES SONT UTILISÉS DANS LE MANUEL ET SUR LES ÉTIQUETTES DE LA MACHINE, POUR METTRE L'UTILISATEUR EN GARDE CONTRE DES RISQUES DE BROYAGE ET DE PINÇAGE. TOUTE INFRACTION AUX PROCÉDURES, PRATIQUES, USW. DE FONCTIONNEMENT PEUVENT OCCASIONNER DES BLESSURES OU LA MORT.

WARNING - DIESE IM HANDBUCH UND AUF DEN WERKZEUGSCHILDERN VERWENDETEN SYMBOLE WEISEN DEN BENUTZER DARAUF HIN, DAß EINE EINKLEMM- UND QUETSCHGEFAHR BESTEHT. EINE NICHTBEFOLGUNG DER ORDNUNGSGEMÄßEN BEDIENUNGSVORSCHRIFTEN, -VERFAHREN, USW. KANN KÖRPERVERLETZUNGEN ODER DEN TOD VERURSACHEN.

ПрЕДУПрЕЖДЕНИЕ - Эти символы используются в Руководстве и на табличках в установке для того, чтобы предупредить пользователя о существовании опасности защемления и раздавливания. Если не применять надлежащие режимы и методы работы, это может привести к травмам или несчастным случаям со смертельным исходом.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

CAUTION - This symbol is used in the manual, and on labels in the Tool, to alert the user to the presence of important operation and maintenance information, which, if not strictly observed, can result in damage to, or destruction of, equipment.

ATTENTION - Ce symbole est utilisés dans le manuel et sur des étiquettes de la machine, pour avertir l'utilisateur de la présence d'instructions importantes de fonctionnement et d'entretien qui, si elles ne sont pas suivies, peuvent occasionner des dommages au matériel, ou sa destruction.

VORSICHT - Dieses im Handbuch und auf den Werkzeugschildern verwendete Symbol weisen den Benutzer darauf hin, daß wichtige Betriebs- und Wartungsvorschriften vorliegen, die streng eingehalten werden müssen, um eine Beschädigung bzw. Zerstörung des Geräts zu vermeiden.

ПрЕДОСТЕрЕЖЕНИЕ - Этот символ используется в Руководстве и на табличках в установке для того, чтобы предупредить пользователя о существовании важных указаний по эксплуатации и техническому обслуживанию, несоблюдение которых может привести к повреждению или разрушению оборудования.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

CAUTION - This symbol is used in the manual, and on the Tool, to alert the user to the presence of chemical risk or hazard of an operating procedure or practice, which, if not correctly followed, can result in personal injury or bodily damage to personnel.

ATTENTION - Ce symbole est utilisés dans le manuel et sur la machine, pour mettre l'utilisateur en garde contre un risque ou un danger chimique lors d'une procédure ou une pratique de fonctionnement, qui, si elle n'est pas suivie, peut causer des blessures.

VORSICHT - Dieses im Handbuch und auf dem Werkzeug verwendete Symbol weisen den Benutzer darauf hin, daß bei einer nicht ordnungsgemäßen Beachtung eines Betriebsverfahrens oder -vorgangs chemische Gefährdungen bzw. Risiken vorliegen, die dem Bedienpersonal Körperverletzungen und Schäden verursachen können.

ПрЕДОСТЕрЕЖЕНИЕ - Этот символ используется в Руководстве и на установке для того, чтобы предупредить пользователя о существовании химических рисков, связанных с применением определенного режима или метода работы, и о том, что неправильное использование этого режима или метода работы может привести к травмам или телесным повреждениям производственного персонала.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

NOTE:

This symbol is used in the manual to alert the user to additional information, operating procedures, or conditions, which should be read and understood to aid in the use operation, or maintenance of the wafer polisher.

Ce symbole est utilisé dans le manuel pour avertir l'utilisateur de l'existence d'informations additionnelles, de procédures ou de conditions de fonctionnement, qu'il faut lire et comprendre pour bien faire fonctionner ou entretenir le polisseur de tranches.

Dieses im Handbuch verwendete Symbol weist den Benutzer auf zusätzliche Informationen, Betriebsverfahren oder Zustände hin, die zur Anwendung, zum Betrieb oder zur Wartung der Wafer-Poliermaschine gelesen und verstanden werden müssen.

Этот символ используется в Руководстве для того, чтобы предупредить пользователя о существовании дополнительной информации или правил работы, с которыми следует внимательно ознакомиться и в которых следует хорошо разобраться для того, чтобы эксплуатировать и обслуживать машину для полирования пластин надлежащим образом.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

This symbol (protective conductor terminal) is used to identify terminals in the Tool that are connected to the Tool's Protective Bonding Circuit by a conductor with a color other than the bi-color GREEN-AND-YELLOW. The Tool's Protective Bonding Circuit is connected to an external protective earth ground for safety purposes.

Ce symbole (terminal conducteur protecteur) est utilisé pour identifier les terminaux de l'outil qui sont connectés au circuit de liaison de l'outil par un conducteur qui a une couleur autre que les deux couleurs du fil bicolore VERT-ET-JAUNE. Le circuit de liaison de l'outil est connecté à une mise à la terre protectrice externe à des fins de sécurité.

Dieses Symbol (Schutzleiteranschluß) kennzeichnet Werkzeuganschlüsse, die mit einem Leitungsdrahts mit einer anderen Farbe als das zweifarbige GRÜN UND GELB an die Schutzerdeschaltung des Werkzeugs angeschlossen sind. Aus Sicherheitsgründen ist die Schutzerdeschaltung des Werkzeugs an eine externe Schutzerde angeschlossen.

Этот символ («Защитный зажим») используется для обозначения таких зажимов установки, которые соединены с ее схемой защитного заземления не двуцветным (ЗЕЛЕНЫМ и ЖЕЛТЫМ) проводом, Схема защитного заземления установки подключена к внешней системе защитного заземления.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

PE

This designation is used to identify the ONE terminal in the Tool that connects the Tools protective Bonding Circuit to the external protective earth conductor of the incoming supply system. This designation is used with a Protective Bonding Circuit icon shown above.

Cette désignation est utilisée pour identifier le SEUL terminal de l'outil qui connecte le circuit de liaison de l'outil au conducteur de mise à la terre protectrice du système d'alimentation entrante. Cette désignation est utilisée avec l'icone de circuit de liaison protectrice indiquée ci-dessus.

Diese Bezeichnung identifiziert den EINZIGEN Anschluß im Werkzeug, mit dem seine Schutzerdeschaltung mit der externen Schutzerde des Speiseversorgungssystem verbunden ist. Diese Bezeichnung wird zusammen mit dem oben gezeigten Symbol für die Schutzerdeschaltung benutzt.

Этот знак используется для обозначения ЕДИНСТВЕННОГО зажима установки, соединяющего ее схему защитного заземления с внешним заземляющим проводом системы электропитания. Данный знак используется вместе с изображенным выше графическим символом схемы защитного заземления.

continued on next page

Danger, Warning, Caution, and Note Icons, continued

This symbol (functional earth terminal) is used to identify a terminal in the Tool that is intended to be earthed for any functional purpose OTHER THAN SAFETY.

Ce symbole (terminal fonctionnel de mise à la terre) est utilisé pour identifier un terminal de l'outil qui doit être mis à la terre pour tout objectif fonctionnel AUTRE QUE LA SÉCURITÉ.

Dieses Symbol (funktioneller Erdungsanschluß) identifiziert eine Anschlußklemme im Werkzeug, die für einen ANDEREN Funktionszweck als für Sicherheit geerdet werden soll.

Этот символ («Зажим для функционального заземления») используется для обозначения зажима установки, предназначенного для заземления оборудования с какой-то функциональной целью, А НЕ С ЦЕЛЬЮ ЗАЩИТЫ.

Emergency OFF (EMO) Circuit

DANGER - DO NOT DISABLE OR COVER ANY EMO. DISABLING OR COVERING AN EMO CAN KEEP THE TOOL FROM BEING STOPPED IN CASE OF AN EMERGENCY. THIS CAN RESULT IN SEVERE INJURY OR LOSS OF LIFE.

DANGER - NE DÈBRANCHEZ OU NE COUVREZ AUCUN BOUTON D'ARRÍT D'URGENCE. SI VOUS DÈBRANCHEZ OU COUVREZ UN BOUTON D'ARRÍT D'URGENCE, VOUS RISQUEZ D'EMPÍCHER LA MACHINE DE S'ARRÍTER EN CAS D'URGENCE. VOUS RISQUEZ UNE BLESSURE SÈRIEUSE OU LA MORT.

GEFAHR - DIE NOTABSCHALTER DÜRFEN NICHT DEAKTIVIERT ODER VERDECKT WERDEN, DA SONST IM NOTFALL MÖGLICHERWEISE KEINE ABSCHALTUNG GESICHERT IST. DIES KANN SCHWERE VERLETZUNGEN BZW. DEN TOD VERURSACHEN.

ОПАСНОСТЬ - Запрещается отключать или закрывать колпачком любую кнопку аварийного останова. Отключение или закрытие такой кнопки лишит оператора возможности остановить установку в случае возникновения аварийной ситуации. Это может привести к тяжелой травме или несчастному случаю со смертельным исходом.

continued on next page

Emergency OFF (EMO) Circuit, continued

Introduction An Emergency Off (EMO) button should be pushed whenever an emergency condition is observed. This includes any possibility of injury or danger to personnel, or if the Tool begins to behave in an erratic or unexpected way. Pushing an EMO button will immediately remove all voltage from the Tool and stop the polisher motion. It will stop the upper head assembly and polish heads in whatever position they are in and shut down all communications between the user and the equipment from the control console. Any information that was not saved before the event will not be recorded. Refer to Figure 3-1 on page 3-18 and Table 3-1 on page 3-19 for the location and descriptions of the Emergency Off (EMO) buttons and switches. Refer to Figure 3-2 on page 3-20 for the EMO circuit wiring schematic.

continued on next page

Emergency OFF (EMO) Circuit, continued

Electrical Cabinet EMOs

All high voltage areas in the Electrical Cabinet are protected by an EMO circuit. When the Electrical Cabinet EMO circuit is broken, electrical power to the entire Tool is immediately shut off. Opening any of the EMO protected access doors will stop all Tool processes and disable further computer control. Recovery from an Electrical Cabinet EMO requires activating the control panel “reset” switch, and do the full “Tool Startup” on page 4-27 in the AvantGaard™ 676 User Manual. Refer to Figure 3-1 and Table 3-1 for the location and descriptions of the Emergency Off (EMO) buttons and switches.

continued on next page

Emergency OFF (EMO) Circuit, continued

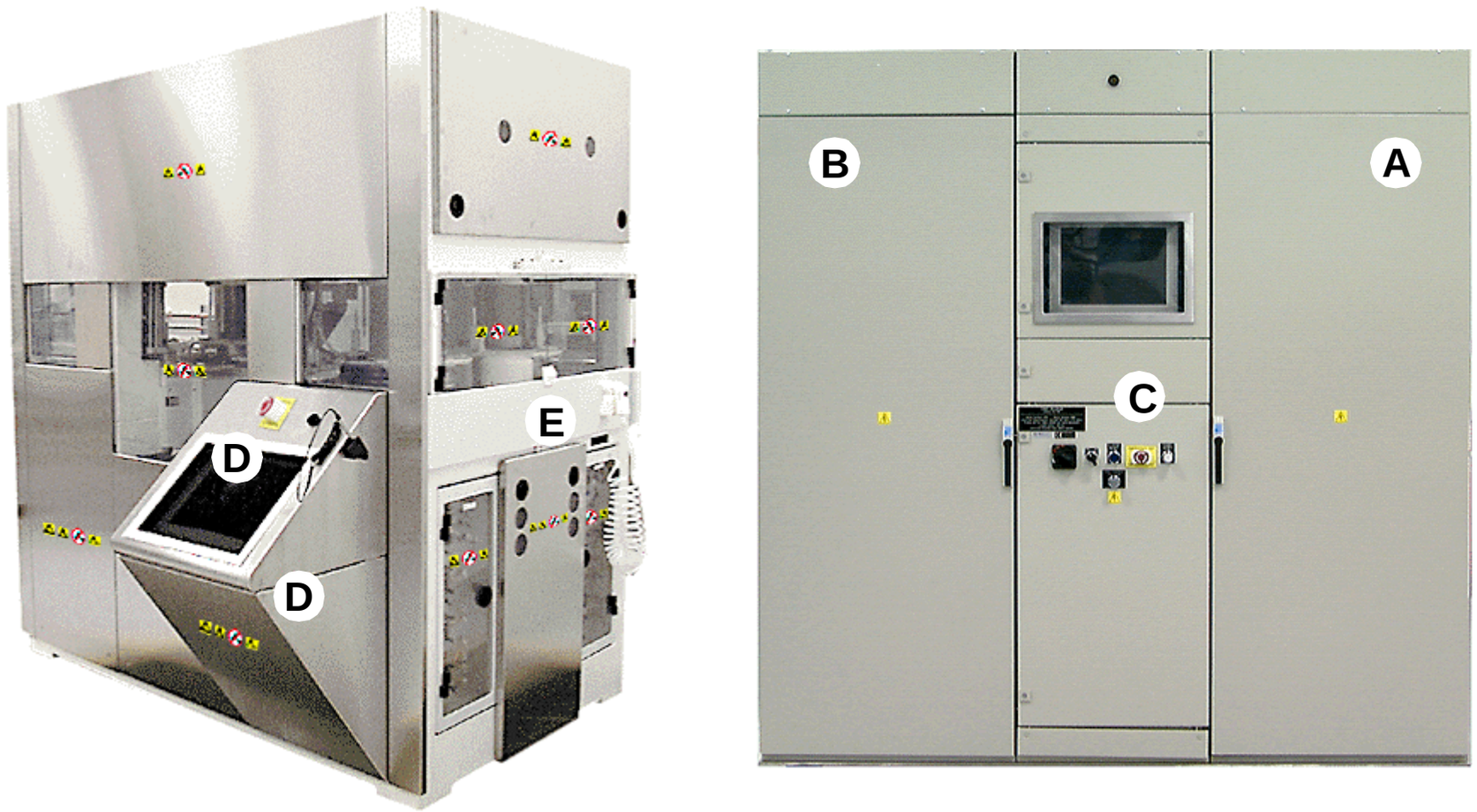


Figure 3-1. EMO Locations

continued on next page

Emergency OFF (EMO) Circuit, continued

EMO Locations

Refer to Figure 3-1 on page 3-18 for the locations of the Emergency Off (EMO) buttons and switches. Refer to Figure 3-2 on page 3-20 for the EMO circuit wiring schematic.

Table 3-1. EMO Locations

Location	Description
A	Behind the low voltage swing panel on the right side of the Electrical Cabinet (1 location)
B	Behind the low voltage swing panel on the left side of the Electrical Cabinet (1 location)
C	Main Power Panel door on the Electrical Cabinet (1 location)
D	Operator Side Control Station and monitor cover (2 locations, one on top and one located between top and bottom halves of the cover)
E	All sides of the Tool frame have an EMO button (3 locations)

EMO Reset

Before resetting the Emergency Off button(s), position the Electrical Cabinet ON/OFF switch and Main Disconnect to OFF. To reset the EMO, twist the EMO button to release it, and do the full “Tool Startup” on page 4-27 in the AvantGaard™ 676 User Manual.

continued on next page

Emergency OFF (EMO) Circuit, continued

EMO Wiring All red wires in the Tool are part of the 24VAC EMO circuit. Figure 3-2 shows the EMO circuit wiring schematic.

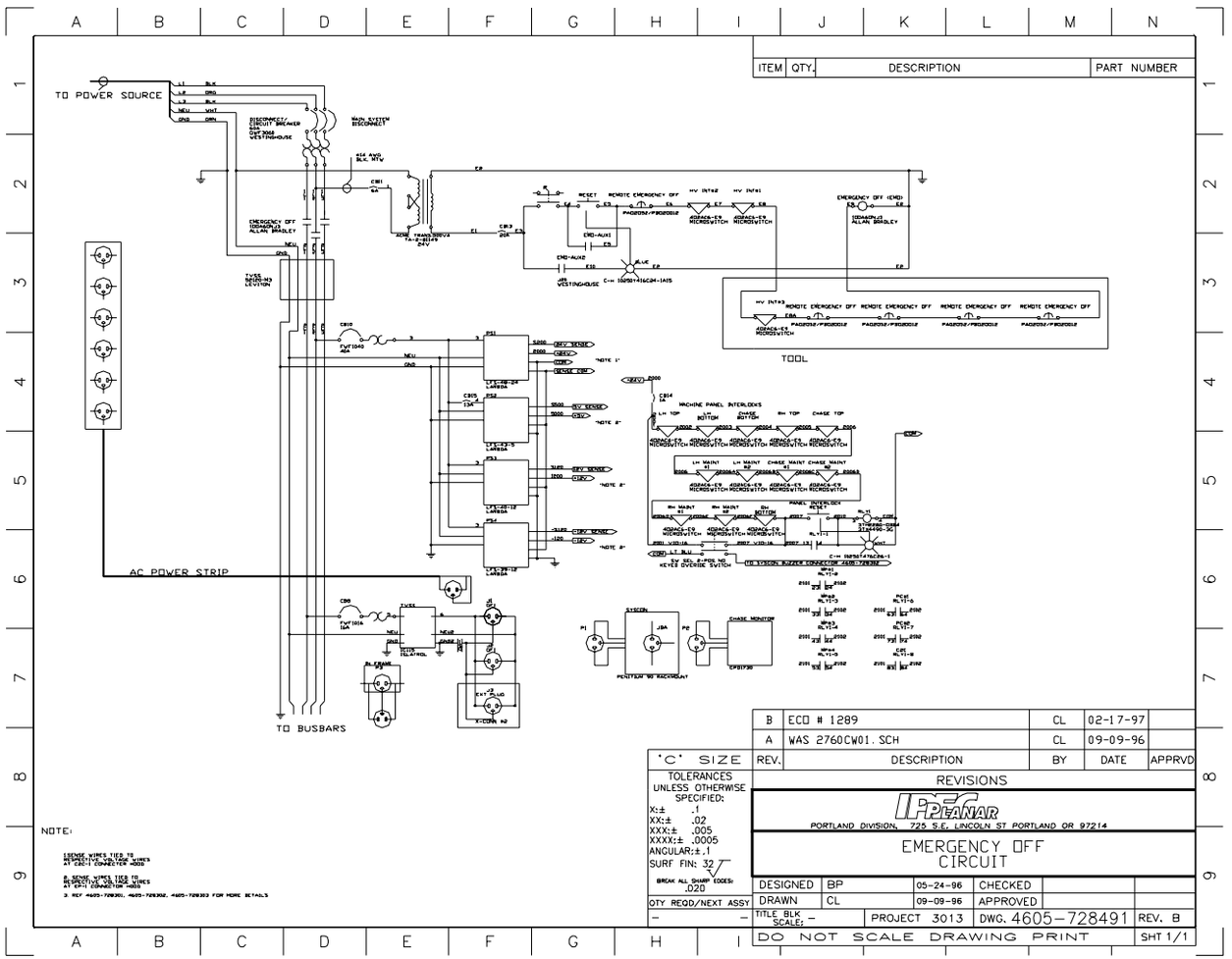

TO POWER SOURCE
AC POWER STRIP
TO BUSBARS
TOOL
ITEM QTY. DESCRIPTION PART NUMBER
B ECO # 1289 CL 02-17-97
A WAS 2760CW01.SCH CL 09-09-96
REV. DESCRIPTION BY DATE APPRVD
REVISIONS
'C' SIZE
TOLERANCES UNLESS OTHERWISE SPECIFIED:
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214
EMERGENCY OFF CIRCUIT
DESIGNED BP 05-24-96 CHECKED
DRAWN CL 09-09-96 APPROVED
PROJECT 3013 DWG. 4605-728491 REV. B
DO NOT SCALE DRAWING PRINT SHT 1/1

Figure 3-2. EMO Electrical Wiring Schematic

System Interlocks

Introduction System panel interlocks prevent personnel from opening potentially dangerous access panels and doors during Tool operation. All critical component access doors on the Tool are connected to the safety interlock circuit which is designed to stop machine operations if an interlock door is opened. These doors must be closed before the Tool can be operated.

If an access door is opened during operation, the system will stop all motion, an alarm tone will sound and an error message identifying the problem will be displayed on the control stations screens. System operation can only be resumed when the access door has been closed, and the operator issues a command to continue. An interlock violation shuts off all power to items using 24V or below. There are 12 panel interlocks. Refer to Figure 3-3 on page 3-23 for interlock locations and Table 3-2 on page 3-24 for descriptions.

Operation An important part of operational safety for the AvantGaard™ 676 are the system interlocks. System interlocks keep potentially dangerous access panels and doors from being opened during Tool operation. The system interlock circuit is designed to stop machine operations if an interlock door is opened.

When any interlocked panel or door is opened on the Tool during production, the circuit is tripped and a signal is sent to the computer. The panel interlock relay immediately stops all component movement and brings the system to a halt. An alarm tone sounds, and an error message is displayed on the terminal telling the operator of the interlock violation. After the interlocked panel has been closed, the operator then presses the panel reset (on Electrical Cabinet) and can continue operation.

continued on next page

System Interlocks, continued

WARNING - DO NOT OPERATE THE TOOL WITH ANY INTERLOCK OVERRIDDEN OR ANY EMO BUTTON DISABLED. SEVERAL MECHANICAL COMPONENTS IN THE PROCESS ENCLOSURES ARE CAPABLE OF CAUSING BODILY INJURY. ONLY QUALIFIED MAINTENANCE PERSONNEL MAY OPERATE THE TOOL WHILE AN INTERLOCK IS DEFEATED.

N'UTILISEZ PAS LA MACHINE APRËS AVOIR DÈBRANCHÈ DES INTERRUPTEURS DE VERROUILLAGE OU DES BOUTONS D'ARRÍT D'URGENCE. PLUSIEURS ÈLÈMENTS MÈCANIQUES SE TROUVANT ‡ L'INTÈRIEUR DES ENCEINTES DE TRAITEMENT PEUVENT CAUSER DES BLESSURES. SEUL, DU PERSONNEL D'ENTRETIEN QUALIFIÈ PEUT UTILISER LA MACHINE QUAND UN VERROUILLAGE EST DÈBRANCHÈ.

DAS WERKZEUG DARF NICHT MIT ÜBERSTEUERTEN VERRIEGELUNGEN ODER DEAKTIVIERTEN NOTABSCHALTERN BETRIEBEN WERDEN. INNERHALB DER SCHUTZABDECKUNGEN BEFINDEN SICH MEHRERE MECHANISCHE BAUTEILE, DIE KÖRPERVERLETZUNGEN HERVORRUFEN KÖNNEN. FALLS EINE VERRIEGELUNG ÜBERSTEUERT WIRD, DARF DIE MASCHINE NUR VON QUALIFIZIERTEM WARTUNGSPERSONAL BETRIEBEN WERDEN.

ПрЕДУПрЕЖДЕНИЕ - Запрещается пускать в ход установку при отключенном блокировочном устройстве или отключенной кнопке аварийного останова. Некоторые механические детали, находящиеся внутри корпусов технологического оборудования, способны нанести телесные травмы. В том случае, если какое-то из блокировочных устройств отключено, только квалифицированному обслуживающему персоналу разрешается пускать в ход установку.

System Interlocks, continued

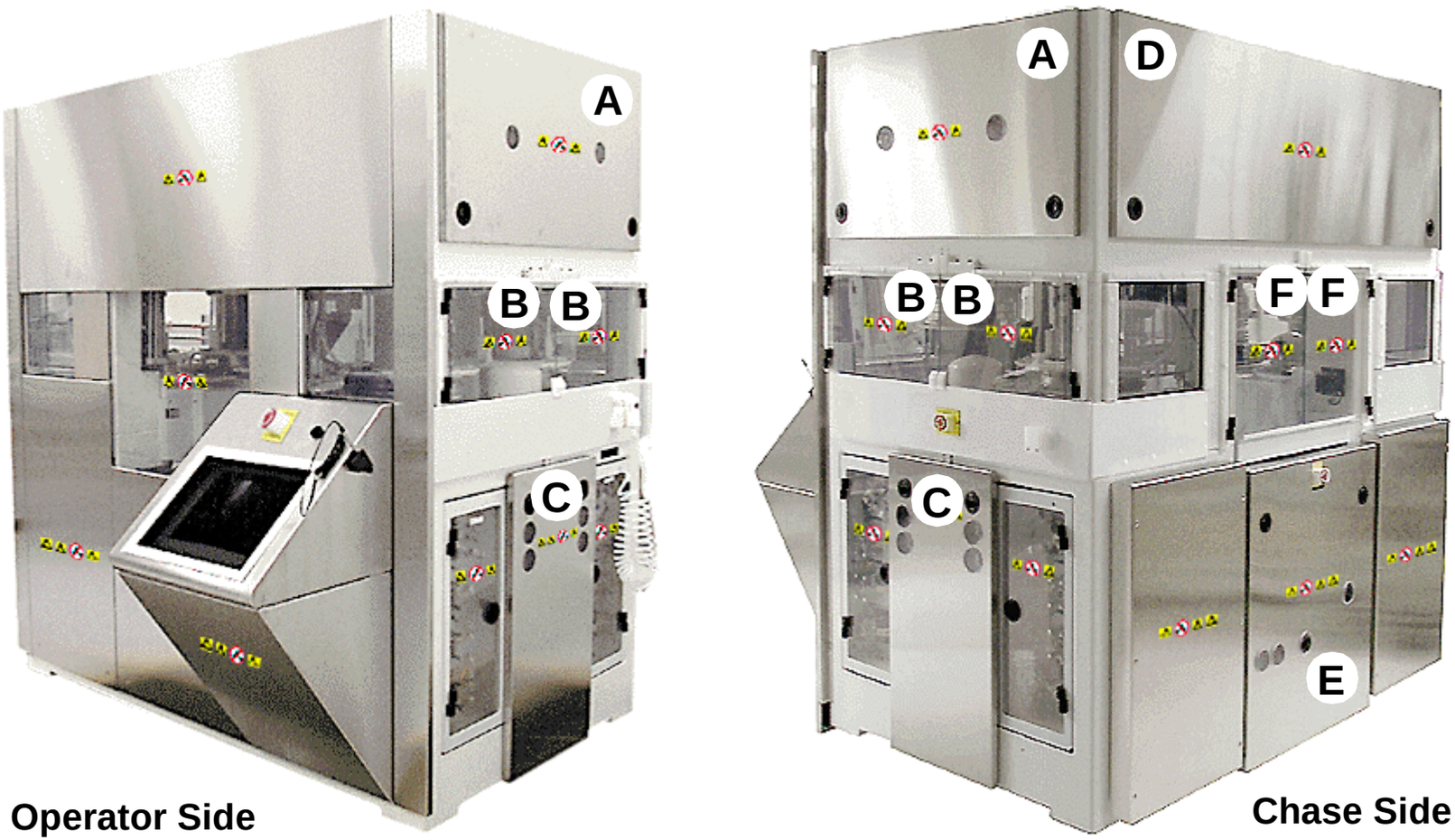


Figure 3-3. System Interlock Locations

continued on next page

System Interlocks, continued

Location Description

Refer to Figure 3-3 for the locations of the 12 system interlocks. The operator door interlocks include all doors and panels covering machine compartments. These are the compartments that the operator would be in or near during normal operation of the Tool. Opening an access doors will cause the Tool to halt. The interlocks can be over-ridden by pulling out the interlock switch actuator located behind the door. Closing the door will reset the interlock switch.

Table 3-2. System Interlock Locations and Descriptions

Location	Description
A	MP upper pneumatic exterior panels (2 locations)
B	Side access doors (4 locations)
C	MP lower pneumatic exterior panels (2 locations)
D	C2C upper pneumatic exterior panel (1 location)
E	C2C lower pneumatic exterior panel (1 location)
F	Chase side maintenance access doors (2 locations)

NOTE: **The bay side operator access door is an automatic (software controlled) door. It is not interlocked. It is lowered by a magnetic breakaway cylinder and is not considered to be a safety hazard.**

continued on next page

System Interlocks, continued

Normal Stop	Use the light pen to click the STOP ALL button to do a normal stop of the Tool from Production Mode. This will cause an orderly shutdown of the components by the SysCon software.

Alarm Messages

Introduction When a system violation or malfunction occurs, an EMO is pressed, or a system interlock violation occurs, an alarm and error message(s) will be given to the operator both visually and audibly. Visually, error messages are displayed on the control stations screens. These messages will identify the type of error and will usually display a question that will lead the operator to give a command solution.

Audible alarm tones, controlled by the System Control (SysCon) computer, accompany all error conditions and alert the operator to respond to a problem. There are two alarm speakers on the Tool, one on the operator control station next to the EMO, and the second on the Electrical Cabinet, center section on the top shelf. Both speakers use 24VDC from the C2C low voltage panel assembly.

System Malfunction When a component or process fails or exceeds a movement time limit, the alarm tone will sound and an error message will be displayed on the control stations screens.

The error messages displayed on the control station screens are listed in Chapter 7 of the AvantGaard™ 676 User Manual.

continued on next page

Alarm Messages, continued

Optional Light Tower

A 3-color light tower is mounted on the Tool to alert the operator of Tool status. See Figure 3-4 on page 3-28. The unit is mounted on the operator side of the Tool above the flat panel display. The light tower is a 24 VDC system with bulbs rated at 11 watts. See Table 3-3 for a description of the Tool conditions when each light comes ON.

Table 3-3. Light Tower Alarms

Light Color	Description
RED	Emergency, hazardous condition, immediate action required
YELLOW	Abnormal condition, impending hazardous condition, immediate action required
GREEN	Normal condition

continued on next page

Alarm Messages, continued

Figure 3-4. Light Tower

Mechanical Hazards

Introduction Before operating the Tool, maintenance personnel and Tool operators should read and understand the following mechanical hazards related to the AvantGaard™ 676 components, assemblies, and systems.

- “Wafer Head” on page 3-30
- “Polish Head Diaphragm” on page 3-32
- “Polish Head” on page 3-34
- “Advanced Pad Motion Option” on page 3-35
- “Drive Belts” on page 3-36
- “C2C Module Robot” on page 3-37
- “Hine® Z Axis Brake” on page 3-38
- “Operator Access Door” on page 3-39
- “Tool Doors” on page 3-41
- “Slurry Pumps” on page 3-42
- “Broken Wafers” on page 3-43

continued on next page

Mechanical Hazards, continued

Wafer Head

WARNING - DO NOT PUT YOUR HANDS OR TOOLS BETWEEN THE HEAD ASSEMBLIES WHEN THE WAFER HEAD IS COMING DOWN. THE TWO COMPONENTS OF THE HEAD ASSEMBLIES ARE THE WAFER AND POLISH HEADS. THE CYLINDER WHICH MOVES THE WAFER HEAD ASSEMBLY DOWN TO THE POLISH PAD CAN PRODUCE 4000 POUNDS OF FORCE. THE TOOL SIDE ACCESS DOORS AND THE SPRAY SHIELDS ARE CONNECTED TO INTERLOCKS TO PROTECT THE OPERATOR.

WARNING - NE PLACEZ PAS VOS MAINS OU DES OUTILS ENTRE LES ASSEMBLAGES DE TÊTE QUAND LA TÊTE DE PLAQUETTE EST EN TRAIN DE DESCENDRE. LES ASSEMBLAGES DE TÊTE SONT COMPOSÉS PAR DEUX ÉLÉMENTS : LA TÊTE DE PLAQUETTE ET LA TÊTE DE POLISSAGE. LE CYLINDRE QUI FAIT DESCENDRE L ASSEMBLAGE DE TÊTE DE PLAQUETTE JUSQU À LA PLAQUE DE POLISSAGE EST CAPABLE DE PRODUIRE UNE FORCE DE 4000 LIVRES. LES PORTES D ACCÈS SE TROUVANT SUR LES CÔTÉS DE LA MACHINE ET LES BOUCLIERS DU GICLEUR SONT CONNECTÉS À DES VERROUILLAGES POUR PROTÉGER L UTILISATEUR.

continued on next page

Mechanical Hazards, continued

WARNING - BEIM ABSENKEN DES WAFERKOPFES DIE HÄNDE ODER WERKZEUGE NICHT ZWISCHEN DIE KOPFAGGREGATE EINFÜHREN. DIE ZWEI KOMPONENTEN DER KOPFAGGREGATE WERDEN VON DEN WAFER- UND POLIERKÖPFEN GEBILDET. DER ZYLINDER, DER DAS WAFERKOPFAGGREGAT AUF DAS POLIERKISSEN ABSENKT, KANN ÜBER 1.800 KG DRUCK AUSÜBEN. ZUM SCHUTZ DES BEDIENERS SIND DIE SEITLICHEN ZUGANGSTÜREN DER MASCHINE UND DIE SPRÜHSCHILDER MIT VERRIEGELUNGEN VERBUNDEN.

ПрЕДУПрЕЖДЕНИЕ - Запрещается помещать руки или инструмент между узлами головок во время опускания головки для пластин. Узлы головок состоят из двух элементов – головки для пластин и полировальной головки. Цилиндр, перемещающий головку для пластин вниз к полировальной опоре, может развивать усилие до 400 фунтов. Для защиты оператора боковые двери для доступа внутрь установки и брызгозащитные щитки соединены с блокировочными устройствами.

continued on next page

Mechanical Hazards, continued

Polish Head Diaphragm

WARNING - KEEP BACK FROM THE POLISH DIAPHRAGM IF IT IS INFLATED WHILE THE WAFER HEAD IS IN THE UP POSITION. THE POLISH DIAPHRAGM IS INFLATED DURING POLISHING TO PRODUCE AN EVEN POLISH PRESSURE. IT IS POSSIBLE TO OVERINFLATE THE POLISH DIAPHRAGM, ESPECIALLY IF THE WAFER HEAD IS IN THE UP POSITION. OVER INFLATING THE POLISH DIAPHRAGM WILL CAUSE THE POLISH PAD TO BALLOON UP AND CAN BLOW THE POLISH PAD ASSEMBLY OFF OF THE POLISH HEAD.

AVERTISSEMENT - ÉCARTEZ-VOUS DU DIAPHRAGME DE POLISSAGE S IL EST GONFLÉ QUAND LES TÊTES DE PLAQUETTE SONT EN POSITION ÉLEVÉE. LE DIAPHRAGME DE POLISSAGE EST GONFLÉ PENDANT LE POLISSAGE POUR PRODUIRE UNE PRESSION UNIFORME DE POLISSAGE. IL EST POSSIBLE DE TROP GONFLER LE DIAPHRAGME DE POLISSAGE, SURTOUT QUAND LA TÊTE DE PLAQUETTE EST EN POSITION TOTALEMENT ÉLEVÉE. UN GONFLAGE EXCESSIF DU DIAPHRAGME DE POLISSAGE PEUT PROVOQUER UN BALLONNEMENT DU DIAPHRAGME ET PEUT ÉCARTER L ENSEMBLE DE PLAQUE DE POLISSAGE DE LA TÊTE DE POLISSAGE.

continued on next page

Mechanical Hazards, continued

WARNING - ABSTAND ZUR POLIERMEMBRAN HALTEN, WENN DIESE BEI ANGEHOBENEM WAFERKOPF AUFGEBLASEN IST. DIE POLIERMEMBRAN IST WÄHREND DES POLIERENS AUFGEBLASEN, UM EINEN GLEICHMÄßIGEN POLIERDRUCK AUSZUÜBEN. DIE POLIERMEMBRAN KANN ZU STARK AUFGEBLASEN WERDEN, BESONDERS WENN SICH DER POLIERKOPF IN DER MIT DER OBERSEITE NACH OBEN WEISENDEN POSITION BEFINDET. BEI EINER ÜBERMÄßIGEN AUFBLASUNG ERWEITERT SICH DAS POLIERKISSEN BALLONARTIG, UND DAS GESAMTE POLIERKISSENAGGREGAT KANN VOM POLIERKOPF LOSGEBLASEN WERDEN.

ПрЕДУПрЕЖДЕНИЕ - Следует держаться в отдалении от наполненной воздухом полировальной диафрагмы, когда головка для пластин находится в верхнем положении. Полировальная диафрагма наполняется воздухом на время полирования, благодаря чему создается равномерное полировальное давление. Существует вероятность чрезмерного раздутия полировальной диафрагмы, особенно когда головка для пластин находится в верхнем положении. Если полировальная головка чрезмерно раздута, полировальная опора приподнимется и может оторваться от полировальной головки.

continued on next page

Mechanical Hazards, continued

Polish Head

DO NOT PUT YOUR HANDS OR TOOLS BETWEEN THE POLISH HEAD WAVE GENERATOR AND THE DRAIN BASIN. THE POLISH HEAD ORBITS AT A RATE THAT CAN CAUSING DAMAGE OR PERSONAL INJURY IF YOUR HANDS OR TOOLS ARE BETWEEN THE WAVE GENERATOR AND THE DRAIN BASIN.

AVERTISSEMENT - NE PLACEZ PAS VOS MAINS OU DES OUTILS ENTRE LE GÉNÉRATEUR D ONDES DE LA TÊTE DE POLISSAGE ET LE BASSIN DE DRAINAGE. LA TÊTE DE POLISSAGE TOURNE À UNE VITESSE QUI PEUT CAUSER DES BLESSURES OU DES DOMMAGES SI VOS MAINS OU DES OUTILS SE TROUVENT ENTRE LE GÉNÉRATEUR D ONDES ET LE BASSIN DE DRAINAGE.

WARNING - DIE HÄNDE BZW. WERKZEUGE NICHT ZWISCHEN DEN WELLENGENERATOR DES POLIERKOPFES UND DAS ABFLUßBECKEN EINFÜHREN. DIE KREISFÖRMIGE BEWEGUNG DES POLIERKOPF FINDET MIT EINER GESCHWINDIGKEIT STATT, DIE BEI ANWESENHEIT VON HÄNDEN ODER WERKZEUGEN ZWISCHEN DEM WELLENGENERATOR UND DEM ABFLUßBECKEN ZU SACHSCHÄDEN ODER KÖRPERVERLETZUNGEN FÜHREN KANN.

WARNING - ПрЕДУПрЕЖДЕНИЕ - Запрещается помещать руки или инструмент между генератором волн, установленным на полировальной головке, и сливным резервуаром. Полировальная головка вращается по орбите со скоростью, при которой она может нанести телесное повреждение или травму в том случае, если между генератором волн и сливным резервуаром находятся руки или инструмент.

continued on next page

Mechanical Hazards, continued

Advanced Pad Motion Option

DO NOT PUT YOUR HANDS OR TOOLS BETWEEN THE ADVANCED PAD MOTION (APM) OPTION COMPONENTS. THE STEPPER MOTOR AND POLISH HEAD MOVEMENTS CAN CAUSE DAMAGE OR PERSONAL INJURY TO YOUR HANDS OR TOOLS.

AVERTISSEMENT - NE PLACEZ PAS VOS MAINS OU DES OUTILS ENTRE LE GÉNÉRATEUR D ONDES DE LA TÊTE DE POLISSAGE ET LE BASSIN DE DRAINAGE. LA TÊTE DE POLISSAGE TOURNE À UNE VITESSE QUI PEUT CAUSER DES BLESSURES OU DES DOMMAGES SI VOS MAINS OU DES OUTILS SE TROUVENT ENTRE LE GÉNÉRATEUR D ONDES ET LE BASSIN DE DRAINAGE.

WARNING - DIE HÄNDE BZW. WERKZEUGE NICHT ZWISCHEN DEN WELLENGENERATOR DES POLIERKOPFES UND DAS ABFLUßBECKEN EINFÜHREN. DIE KREISFÖRMIGE BEWEGUNG DES POLIERKOPF FINDET MIT EINER GESCHWINDIGKEIT STATT, DIE BEI ANWESENHEIT VON HÄNDEN ODER WERKZEUGEN ZWISCHEN DEM WELLENGENERATOR UND DEM ABFLUßBECKEN ZU SACHSCHÄDEN ODER KÖRPERVERLETZUNGEN FÜHREN KANN.

ПрЕДУПрЕЖДЕНИЕ - Запрещается помещать руки или инструмент между деталями механизма опережающего движения опоры. В этом случае при работе шагового двигателя и при перемещении полировальной головки они могут травмировать руки или повредить инструмент.

Mechanical Hazards, continued

Drive Belts

USE CAUTION IF YOU ARE WORKING ON THE MP LOWER PNEUMATIC PANELS NEXT TO THE LOWER POLISH HEAD DRIVE PULLEY AND BELT. THE LOWER POLISH HEAD DRIVE PULLEY AND BELT ARE EXPOSED AND ARE A PINCH HAZARD WHENEVER THE LOWER PNEUMATIC PANELS ARE REMOVED TO DO SERVICE.

AVERTISSEMENT - FAITES ATTENTION SI VOUS TRAVAILLEZ AUX PANNEAUX PNEUMATIQUES MP DU BAS PRÈS DE LA COURROIE ET DE LA POULIE SITUÉS EN BAS DE LA TÊTE DE POLISSAGE. LA COURROIE ET LA POULIE SITUÉS EN BAS DE LA TÊTE DE POLISSAGE SONT EXPOSÉS ET FONT COURIR UN DANGER DE PINÇAGE QUAND LES PANNEAUX PNEUMATIQUES DU BAS SONT ENLEVÉS POUR LE SERVICE.

WARNING - BEI DER ARBEIT AN DEN UNTEREN PNEUMATISCHEN MP-PANEELEN DER ANTRIEBSSCHEIBE UND DES ANTRIEBSRIEMENS DES UNTEREN POLIERKOPFES MUß VORSICHTIG VORGEGANGEN WERDEN. DIE ANTRIEBSSCHEIBE UND DER ANTRIEBSRIEMEN DES UNTEREN POLIERKOPFS LIEGEN FREI UND KÖNNEN BEI DER ABNAHME DER UNTEREN PNEUMATISCHEN PANEELE, Z.B. ZU WARTUNGSZWECKEN, EINKLEMMUNGEN VERURSACHEN.

WARNING - ПрЕДУПрЕЖДЕНИЕ - Следует проявлять особую осторожность при обслуживании нижних пневматических панелей МП, находящихся рядом с нижним шкивом и ремнем привода полировальной головки. Нижний шкив и ремень привода полировальной головки не закрыты ограждением, и существует опасность защемления при снятии нижних пневматических панелей с целью проведения обслуживания.

continued on next page

Mechanical Hazards, continued

C2C Module Robot

CAUTION - Be aware of the location of the robot, and its movements, when working in the center (C2C) area of the Main Tool. When working in the C2C or teaching robot Tool Points, the robot arm can hit you during radial or vertical movements. If you are hit by the robot, you can be injured or you may damage the wand.

ATTENTION - Faites attention et surveillez le robot quand vous travaillez autour du robot. Si vous travaillez dans l aire centrale (C2C) de la machine principale ou si vous éduquez le robot, le bras du robot peut vous heurter en bougeant verticalement ou en circulairement. Le robot peut vous blesser ou peut causer des dommages au batteur en vous heurtant.

VORSICHT - Bei der Arbeit in der Nähe des Roboters vorsichtig vorgehen und auf die Position des Roboters achten. Bei der Arbeit im mittleren Bereich (C2C) der Hauptmaschine, bzw. wenn der Roboter die Werkzeugpunkte erlernt, können Sie vom Roboterarm getroffen werden, wenn er radiale oder vertikale Bewegungen ausführt. Falls Sie vom Roboter getroffen werden, können Körperverletzungen oder Beschädigungen des Roboterarms auftreten.

CAUTION - ПрЕДОСТЕрЕЖЕНИЕ - При работе в центральной зоне (C2C) установки необходимо учитывать местонахождение робота и траекторию его перемещений. Во время работы в зоне C2C или настройки робота вас может ударить его манипулятор, движущийся в радиальном или вертикальном направлении. В этом случае вы можете получить травму или повредить щуп.

Mechanical Hazards, continued

Hine® Z Axis Brake

The Hine® robot has a fail-safe brake on the Z axis motor. The brake will release only when power is applied to it. When robot power is OFF, the brake prevents any vertical movement. The Hine® robot has an external safety brake release connector which can be used to energize the brake and allow the Z axis to be moved manually. The connector is wired to an interface bracket located on the C2C Upper Pneumatic panel. Each 676 has an external 24VDC power supply. The Z axis brake safety release circuit and external 24VDC power supply are to be used in emergency situations only. Energizing the Z axis brake release connector when robot servos are disabled or robot power is OFF will deactivate the Z axis brake and cause the robot link arms to fall under their own weight.

continued on next page

Mechanical Hazards, continued

Operator
Access
Door

CAUTION - If it is necessary to lean into the C2C system through the operator access door opening, be aware of the operator access door. The operator access door is connected to a break-away cylinder. If the door is unnecessarily moved, it is possible for the door to break-away and hit you. Make sure you do not place your hands on a polish head, hit the robot, or break the operator access door if the door breaks away from the cylinder.

ATTENTION - Faites attention quand vous vous penchez dans le système C2C en passant par l ouverture de la porte d accès de l utilisateur. La porte d accès de l utilisateur est connectée au cylindre de largage. En cas de mouvement inutile de cette porte, elle peut être larguée et vous heurter. Assurez-vous de pas placer vos mains sur une tête de polissage, de ne pas heurter le robot ou de ne pas casser la porte d accès de l utilisateur si la porte est larguée du cylindre.

VORSICHT - Vorsichtig vorgehen, wenn es notwendig ist, daß Sie sich durch die Bedienerzugangstür in das C2C-System hineinbeugen. Diese Zugangstür ist mit einem Losbrechzylinder ausgestattet. Bei unnötiger Bewegung der Tür kann diese losbrechen und auf Sie fallen. Es muß daher sichergestellt werden, daß Sie bei einem Losbrechen der Tür vom Zylinder den Polierkopf nicht mit den Händen berühren oder auf den Roboter fallen oder die Bedienerzugangstür brechen.

CAUTION - ПрЕДОСТЕрЕЖЕНИЕ - В том случае, если необходимо наклониться вовнутрь зоны C2C через проем открытой двери для доступа оператора, следует помнить о существовании этой двери. Дверь для доступа оператора соединена с разъединяющим цилиндром. Если ее двигать без нужды, она может отсоединиться от цилиндра и вас ударить. Ни в коем случае не следует помещать руки на полировальную головку или ударять по роботу или двери для доступа оператора, когда эта дверь отошла от цилиндра.

Mechanical Hazards, continued

NEVER REACH INTO ANY POLISH STATION WHILE THE TOOL IS OPERATING. MECHANISMS START AUTOMATICALLY AND CAN RESULT IN INJURY TO PERSONNEL. ALWAYS END EACH AUTOMATIC OPERATION AND WAIT FOR ALL MECHANISMS TO COME TO A COMPLETE STOP BEFORE REACHING INTO ANY TOOL STATION.

NE TOUCHEZ JAMAIS ‡ UNE STATION DE POLISSAGE QUAND LA POLISSEUSE EST EN FONCTIONNEMENT. DES MÈCANISMES SE METTENT AUTOMATIQUEMENT EN MARCHE ET PEUVENT OCCASIONNER DES BLESSURES. ARRÍTEZ TOUJOURS TOUTES LES OPÈRATION AUTOMATIQUEMENT ET ATTENDEZ QUE TOUS LES MÈCANISMES S'ARRÍTENT COMPLËTEMENT AVANT DE TOUCHER ‡ LA STATION DE POLISSAGE.

WÄHREND DES BETRIEBS DER POLIERMASCHINE, DARF NICHT IN DIE POLIERSTATION EINGEGRIFFEN WERDEN. DIE MASCHINENMECHANISMEN STARTEN AUTOMATISCH UND KÖNNEN ZU KÖRPERVERLETZUNGEN DES PERSONALS FÜHREN. VOR DEM EINGREIFEN IN EINE POLIERSTATION MUß IMMER ERST DER AUTOMATIKBETRIEB BEENDET UND DER VÖLLIGE STILLSTAND ALLER MECHANISMEN ABGEWARTET WERDEN.

ПрЕДУПрЕЖДЕНИЕ - Не допускается помещать руки вовнутрь какой-либо полировальной станции во время работы установки. Ее механизмы начинают работать автоматически и могут нанести травму. Во всех случаях перед тем, как поместить руки вовнутрь какой-либо полировальной станции, необходимо подождать, пока не окончится автоматический цикл работы и пока все механизмы полностью не остановятся.

Mechanical Hazards, continued

Tool Doors

USE CAUTION WHEN OPENING AND CLOSING THE TOOL DOORS. THE DOORS CAN PRESENT A PINCH HAZARD.

FAITES ATTENTION EN OUVRANT ET EN FERMANT LES ENCEINTES DE TRAITEMENT. VOUS RISQUEZ DE VOUS PINCER AVEC CES ENCEINTES DE TRAITEMENT.

WARNING - BEIM ÖFFNEN UND SCHLIEßEN DER SCHUTZABDECKUNGEN VORSICHTIG VORGEHEN. DIE SCHUTZABDECKUNGEN KÖNNEN EINKLEMMUNGEN VERURSACHEN.

WARNING - ПрЕДУПрЕЖДЕНИЕ - Следует соблюдать осторожность при открытии и закрытии дверей установки. При этом возникает опасность защемления.

continued on next page

Mechanical Hazards, continued

Slurry Pumps

NEVER OPERATE THE SLURRY PUMPS WITHOUT THE PLASTIC PROTECTIVE COVER IN PLACE. TOUCHING THE SLURRY PUMP DURING WAFER PROCESSING CAN RESULT IN SEVERE PERSONAL INJURY. AVOID CONTACT WITH THE SLURRY PUMP ROLLERS BY KEEPING THE PLASTIC PUMP COVERS IN PLACE DURING OPERATION.

NE FAITES JAMAIS FONCTIONNER LES POMPES ‡ BOUE SANS LEUR COUVERCLE DE MATIËRE PLASTIQUE. SI VOUS TOUCHEZ ‡ LA POMPE ‡ BOUE PENDANT LE TRAITEMENT DES TRANCHES, VOUS RISQUEZ DES BLESSURES GRAVES. …VITEZ TOUT CONTACT AVEC LES ROULEAUX DE LA POMPE ‡ BOUE EN LAISSANT EN PLACE LES COUVERCLES DE MATIËRE PLASTIQUE PENDANT LE FONCTIONNEMENT DE LA MACHINE.

WARNING - DIE SUSPENSIONSPUMPEN NUR MIT AUFGESETZTER KUNSTSTOFFSCHUTZABDECKUNG BETREIBEN. EINE BERÜHRUNG DER SUSPENSIONSPUMPE WÄHREND DER WAFERBEARBEITUNG KANN SCHWERE KÖRPERVERLETZUNGEN VERURSACHEN. UM EINE BERÜHRUNG DER SUSPENSIONSPUMPENWALZEN AUSZUSCHLIEßEN, MÜSSEN DIE KUNSTSTOFFPUMPENABDECKUNGEN WÄHREND DES BETRIEBS AUFGESETZT BLEIBEN.

WARNING - ПрЕДУПрЕЖДЕНИЕ - Запрещается запускать насосы подачи суспензии, если не установлен пластмассовый защитный кожух. Прикосновение к насосу для подачи суспензии во время обработки пластин может привести к серьезной травме. Для того, чтобы избежать прикосновения к барабанам насоса для подачи суспензии, работающие насосы должны быть закрыты пластмассовыми ограждениями.

continued on next page

Mechanical Hazards, continued

Broken Wafers

CAUTION - Use caution if a wafer breaks during the polishing process. Broken wafer shards are very sharp and can cause injury. Wear rubber gloves when picking up wafer pieces.

ATTENTION - Faites attention si une tranche se brise pendant le processus de polissage. Les Èchardes de tranche de silicium sont trËs pointues et peuvent occasionner des blessures. Portez des gants de caoutchouc quand vous ramassez les Èclats de tranche.

VORSICHT - Falls eine Wafer während des Polierens bricht, muß vorsichtig vorgegangen werden. Die Wafer-Scherben sind sehr scharf und können Verletzungen verursachen. Beim Umgang mit den Scherben Gummihandschuhe tragen.

CAUTION - ПрЕДОСТЕрЕЖЕНИЕ - Следует помнить о том, что в процессе полирования может сломаться пластина. Обломки сломанной пластины являются очень острыми и могут нанести травму. Следует подбирать кусочки пластин в резиновых перчатках.

Electrical Hazards

Introduction Before operating the Tool, maintenance personnel and Tool operators should read and understand the following electrical hazards related to the AvantGaard™ 676 components, assemblies, and systems.

- “EMO Protection” on page 3-45
- “Neutral Wire Color” on page 3-45
- “Mains Disconnect” on page 3-45
- “208, 380, or 460 VAC” on page 3-46
- “Facility High Voltage” on page 3-48
- “EMO Circuit” on page 3-49
- “Interconnect Boxes” on page 3-49
- “HV Panel Assemblies - Disabling Interlocks” on page 3-51
- “Main Power Panel Assembly” on page 3-53
- “C2C Robot Controller Panel Assembly” on page 3-53
- “Pad Conditioner HV Panel Assemblies” on page 3-53
- “High Voltage Panel” on page 3-54
- “Protective Earth Ground” on page 3-55
- “GFIC” on page 3-56
- “Grounding Rods” on page 3-56
- “Ground Bonding Path” on page 3-57
- “Lockout / Tagout Procedure” on page 3-58
- “SEMI S2-91, S2-93 Guidelines” on page 3-60

continued on next page

Electrical Hazards, continued

EMO Protection

All the high voltage components in the Electrical Cabinet are mounted behind the low voltage swing panels. Opening a swing panel will break the EMO circuit and cause electrical power to be shut off to the entire Tool. Use extreme caution if the high voltage panels ever need servicing. Follow correct lockout and tagout procedures whenever maintenance is required in this area.

Neutral Wire Color

In accordance with applicable European requirements, light blue neutral wires are used in all electrical circuits in the Main Tool and in the Electrical Cabinet. A white label, with the word “Neutral”, is wrapped around the ends of each of the neutral wires to comply with domestic requirements.

[S/N 3031] This Tool was originally built with white colored neutral power wires in some locations. To comply with applicable CE regulations, these locations now have light blue heat shrink tubing, with a "NEU" label, to endmark the white neutral power wires.

DANGER - AN APPROVED FACILITIES DISCONNECT IS REQUIRED BETWEEN THE FACILITY MAINS ELECTRICAL POWER AND THE TOOL. IF AN APPROVED DISCONNECT IS NOT USED, THE FACILITY SIDE OF THE TOOL MAIN DISCONNECT WILL STILL BE CONNECTED TO FACILITY ELECTRICAL POWER EVEN AFTER THE TOOL MAIN DISCONNECT HAS BEEN POSITIONED TO OFF.

Mains Disconnect

Make sure an approved facilities disconnect is installed between the facility mains power supply and the Tool. If an approved disconnect is not used, the facility side of the Tool main disconnect will still be connected to facility electrical power even after the Tool main disconnect has been positioned to OFF.

continued on next page

Electrical Hazards, continued

208, 380, or 460 VAC

DANGER - DO NOT TOUCH 208, 380, OR 460 VAC WIRES. THREE PHASE 208, 380, AND 460 VAC ARE VERY HAZARDOUS INDUSTRIAL POWER VOLTAGES THAT CAN CAUSE LOSS OF LIFE. ANY TWO WIRES OF THREE-PHASE AC (ALTERNATING CURRENT) POWER CAN SHOCK WITHOUT REFERENCE TO GROUND. THIS CAPABILITY CAUSES THREE-PHASE AC POWER TO ACT SIMILAR TO DC (DIRECT CURRENT) POWER WHICH MAY NOT ALLOW YOU TO LET GO OF A LIVE WIRE.

DANGER - NE TOUCHEZ PAS AUX C,BLES DE COURANT ALTERNATIF DE 208, 380 OU 460 VOLTS. LES COURANTS ALTERNATIFS TRIPHASÈS DE 208, 380 ET 460 VOLTS SONT DES COURANTS DE PUISSANCE INDUSTRIELLE TRËS DANGEREUX QUI PEUVENT PROVOQUER LA MORT. DEUX C,BLES DE COURANT ALTERNATIF TRIPHASÈ PEUVENT CAUSER UNE COMMOTION ÈLECTRIQUE SANS RÈFÈRENCE ‡ LA TERRE. ¿ CAUSE DE CETTE CARACTÈRISTIQUE, LE COURANT ALTERNATIF TRIPHASÈ AGIT COMME DU COURANT CONTINU ET EMPÍCHE LA PERSONNE DE SE DÈCOLLER D'UN C,BLE SOUS TENSION.

continued on next page

Electrical Hazards, continued

GEFAHR - KEINE 208 V, 380 V ODER 460 V WECHSELSPANNUNGSLEITUNGEN BERÜHREN. DIESE DREIPHASIGEN 208 V, 380 V UND 460 V WECHSELSPANNUNGEN SIND SEHR GEFÄHRLICHE, GROßTECHNISCHE STROMSPANNUNGEN MIT MÖGLICHERWEISE TÖDLICHER WIRKUNG. JEWEILS ZWEI BELIEBIGE LEITUNGSDRÄHTE DER DREIPHASIGEN WECHSELSPANNUNG KÖNNEN OHNE ERDUNG EINEN STROMSCHLAG VERURSACHEN. DADURCH WIRKT DIESER DREIPHASIGE WECHSELSTROM ÄHNLICH EINEM GLEICHSTROM, D.H. ES IST EVENTUELL NICHT MÖGLICH, EINEN STROMFÜHRENDEN DRAHT LOSZULASSEN.

ОПАСНОСТЬ - Запрещается прикасаться к проводам, находящимся под напряжением 208, 380 или 460 V переменного тока. Трехфазное напряжение 208, 380 или 460 V переменного тока является очень опасным промышленным напряжением и может убить человека. При прикосновении к любым двум незаземленным проводам, находящимся под трехфазным напряжением переменного тока, может иметь место поражение электрическим током. В подобном случае трехфазное напряжение переменного тока действует аналогично напряжению постоянного тока, и вы можете оказаться не в состоянии выпустить находящийся под напряжением провод.

continued on next page

Electrical Hazards, continued

DANGER - USE EXTREME CAUTION WHEN WORKING ON, OR NEXT TO, ANY HIGH VOLTAGE PANEL ASSEMBLIES IN THE ELECTRICAL CABINET. THE ELECTRICAL CABINET IS CONSIDERED A CLASS 4 ELECTRICAL HAZARD.

DANGER - FAITES EXTRÊMEMENT ATTENTION QUAND VOUS TRAVAILLEZ SUR UN ASSEMBLAGE DE PANNEAU DE HAUT VOLTAGE, OU À PROXIMITÉ, DANS L ARMOIRE ÉLECTRIQUE. L ARMOIRE ÉLECTRIQUE FAIT COURIR UN DANGER ÉLECTRIQUE DE CLASSE 4.

GEFAHR - BEI DER ARBEIT AN ODER IN DER NÄHE VON HOCHSPANNUNGS-PANEELAGGREGATEN IM STROMSCHRANK MIT GRÖßTER VORSICHT VORGEHEN. DER STROMSCHRANK WIRD ALS ELEKTRISCHE GEFAHR DER KLASSE 4 EINGESTUFT.

ОПАСНОСТЬ - Следует проявлять особую осторожность при обслуживании любых узлов, находящихся на панелях высокого напряжения в электрошкафу, или во время работы поблизости от этих узлов. По опасности поражения электрическим током электрошкаф относится к категории 4.

Facility High Voltage

The AvantGaard™ 676 is powered by 208 volts AC, 3 phase, 60 amp service. Facility high voltage enters the Electrical Cabinet main power panel at the main disconnect. After System Start-up, electrical power for the high voltage panels is transferred along bus bars mounted behind the high voltage area of the Electrical Cabinet. The bus bars are sealed behind labeled panels. This area remains sealed, even during installation. The back panels are bolted into the main cabinet frame but are not interlocked because they are only removable with Tools. Refer to Figure 3-5 for the location of the high voltage components and assemblies.

continued on next page

Electrical Hazards, continued

EMO Circuit

All the high voltage components in the Electrical Cabinet are mounted behind the low voltage swing panels. Opening a swing panel will break the EMO circuit and cause electrical power to be shut off to the entire Tool. Use extreme caution if the high voltage panels need servicing. Follow lockout/tagout procedures whenever maintenance is required in this area.

Interconnect Boxes

Electrical power is supplied from the Electrical Cabinet to the Main Tool through cables connected to the interconnect boxes. These boxes contain high voltage and are labeled as electrical hazards. The interconnect boxes are built and certified to NEMA 4 standards. The covers are electro-polished stainless steel and are only removable with tools. Do not remove these covers without first locking / tagging out the Tool. See “Electrical Hazards, continued” on page 3-58.

continued on next page

Electrical Hazards, continued

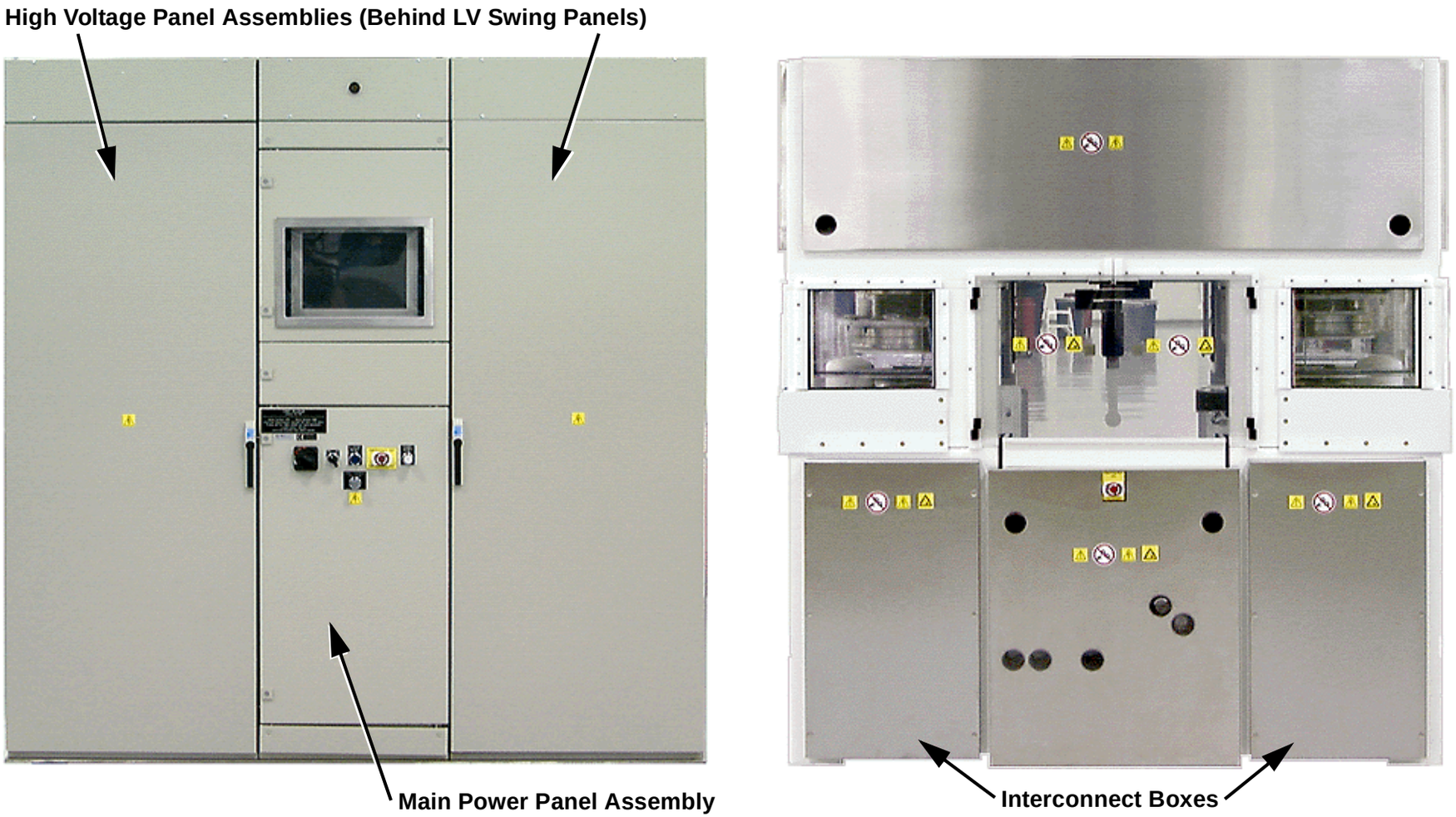


Figure 3-5. High Voltage Locations

continued on next page

Electrical Hazards, continued

HV Panel Assemblies - Disabling Interlocks

DANGER - OPERATORS MUST NOT DISABLE INTERLOCKS OR REMOVE PANELS. DO NOT OPERATE THE TOOL WITH ANY INTERLOCK OVERRIDDEN OR ANY EMO BUTTON DISABLED. HIGH VOLTAGE IS DANGEROUS AND CAN CAUSE LOSS OF LIFE. ONLY QUALIFIED MAINTENANCE PERSONNEL FAMILIAR WITH HIGH VOLTAGE AND THE WAFER POLISHER MAY OPERATE THE TOOL WHILE INTERLOCKS ARE DISABLED OR PANELS ARE REMOVED FOR SERVICING.

DANGER - LES OPÈRATEURS NE PEUVENT PAS DÈBRANCHER LES INTERRUPTEURS DE VERROUILLAGE OU ENLEVER LES PANNEAUX PROTECTEURS. N'UTILISEZ PAS LA MACHINE APRËS AVOIR DÈBRANCHÈ DES INTERRUPTEURS DE VERROUILLAGE OU DES BOUTONS D'ARRÍT D'URGENCE. LE HAUT VOLTAGE EST DANGEREUX ET PEUT CAUSER LA MORT. SEUL, DU PERSONNEL D'ENTRETIEN QUALIFIÈ CONNAISSANT BIEN LE HAUT VOLTAGE ET LE POLISSEUR DE TRANCHES PEUT FAIRE FONCTIONNER LA MACHINE QUAND DES INTERRUPTEURS DE VERROUILLAGE SONT DÈBRANCHÈS OU DES PANNEAUX PROTECTEURS ENLEVÈS POUR L'ENTRETIEN.

continued on next page

Electrical Hazards, continued

GEFAHR - DIE BEDIENER DÜRFEN KEINE VERRIEGELUNGEN DEAKTIVIEREN ODER PANELE ENTFERNEN. DAS WERKZEUG DARF NICHT BETRIEBEN WERDEN, WENN EINE VERRIEGELUNG ÜBERSTEUERT BZW. EIN NOATABSCHALTER DEAKTIVIERT IST. HOCHSPANNUNGEN SIND GEFÄHRLICH UND KÖNNEN ZUM TOD FÜHREN. WERDEN BEI DER WARTUNG VERRIEGELUNGEN DEAKTIVIERT BZW. PANELE ENTFERNT, SO DARF DIE MASCHINE IN DIESEM FALL NUR DURCH QUALIFIZIERTES WARTUNGSPERSONAL, DAS MIT HOCHSPANNUNGEN UND DER WAFER-POLIERMASCHINE VERTRAUT IST, BETRIEBEN WERDEN.

ОПАСНОСТЬ - Операторы не должны отключать блокировочные устройства и снимать панели. Запрещается пускать в ход установку при отключенном блокировочном устройстве или отключенной кнопке аварийного останова. Высокое напряжение представляет опасность и может убить человека. Только квалифицированный обслуживающий персонал, которому известны правила работы под высоким напряжении, и который хорошо знаком с машиной для полирования пластин, может пускать в ход установку, когда отключены блокировочные устройства или сняты для обслуживания панели.

continued on next page

Electrical Hazards, continued

Main Power Panel Assembly

The main power panel assembly is located in the middle enclosure of the Electrical Cabinet and contains the AC and DC power distribution components and the facilities ground connection. There is one main power panel assembly for the Tool. Incoming three-phase power is current limited by the three-pole main circuit breaker. A 6 amp breaker supplies power to the 120/24VAC transformer that powers the Emergency-Off circuit. After going through the EMO contactor, the three-phase power is routed to the vertical bus bars located in the back of the end cabinet sections. A parallel transient voltage surge suppressor filters the AC power. An isolation transformer further conditions the AC power going to the system computer and its accessories. The panel interlock contactor is also located on this panel. A contact from the panel interlock contactor (local stop) is taken to each low voltage panel along with the DC power by a 10 pin connector. The +24VDC, +12VDC, -12VDC, and +5VDC power supply sense lines are tied to their respective output lines inside the hood of the C2C DC power 10 pin connector.

C2C Robot Controller Panel Assembly

The robot controller panel assembly contains the robot controller. The panel assembly is supplied by a 16A single-pole breaker. Startup transients are limited by a MOV (metal-oxide varistor) located on the panel terminal block. A contact from the local stop relay on the C2C low voltage panel assembly is connected to the robot controller EMO input by a 4 pin connector. A 25 foot (7.62 M) cable connects the robot to the robot controller.

Pad Conditioner HV Panel Assemblies

The pad conditioner high voltage panel contains the pad conditioner controller. There is one pad conditioner high voltage panel on each side of the Electrical Cabinet. The panel is supplied by a 16A single-pole breaker. Signals to the Tool are routed through one 24 pin connector (labeled PC-6). Signals to the pad conditioner low voltage panel are routed through one 16 pin connector (labeled PC-3).

continued on next page

Electrical Hazards, continued

High Voltage Panel

The high voltage panel contains a variable-frequency drive, three DC motor controllers, a slurry enable relay, a three-pole contactor, and two three-pole AC motor overload protectors. The high voltage panel is fed by a 16A three-pole breaker. Signals to the machine are routed through one 24 pin connector (labeled MP-6). Signals to the low voltage panel assembly are routed through one 16 pin connector (labeled MP-3). All labels conform to S2-93 standards.

continued on next page

Electrical Hazards, continued

DANGER - USE EXTREME CAUTION WHEN WORKING ON, OR NEXT TO, ANY HIGH VOLTAGE PANEL ASSEMBLIES IN THE ELECTRICAL CABINET. DO NOT OPERATE THE TOOL UNLESS IT IS GROUNDED TO A FACILITY PROTECTIVE EARTH GROUND.

DANGER - FAITES EXTRÊMEMENT ATTENTION QUAND VOUS TRAVAILLEZ SUR UN ASSEMBLAGE DE PANNEAU DE HAUT VOLTAGE, OU À PROXIMITÉ, DANS L ARMOIRE ÉLECTRIQUE.

GEFAHR - BEI DER ARBEIT AN ODER IN DER NÄHE VON HOCHSPANNUNGS-PANEELAGGREGATEN IM STROMSCHRANK MIT GRÖßTER VORSICHT VORGEHEN.

ОПАСНОСТЬ - Следует проявлять особую осторожность при обслуживании любых узлов, находящихся на панелях высокого напряжения в электрошкафу, или во время работы поблизости от этих узлов. Запрещается пускать в ход установку, если она не подключена к системе защитного заземления предприятия.

Protective Earth Ground

The AvantGaard™ 676 must be properly grounded to a facility protective earth ground. The external ground location for the Tool is located in the Electrical Cabinet and is identified by a protective earth label. Refer to Figure 3-6 for the location of the external ground connection.

continued on next page

Electrical Hazards, continued

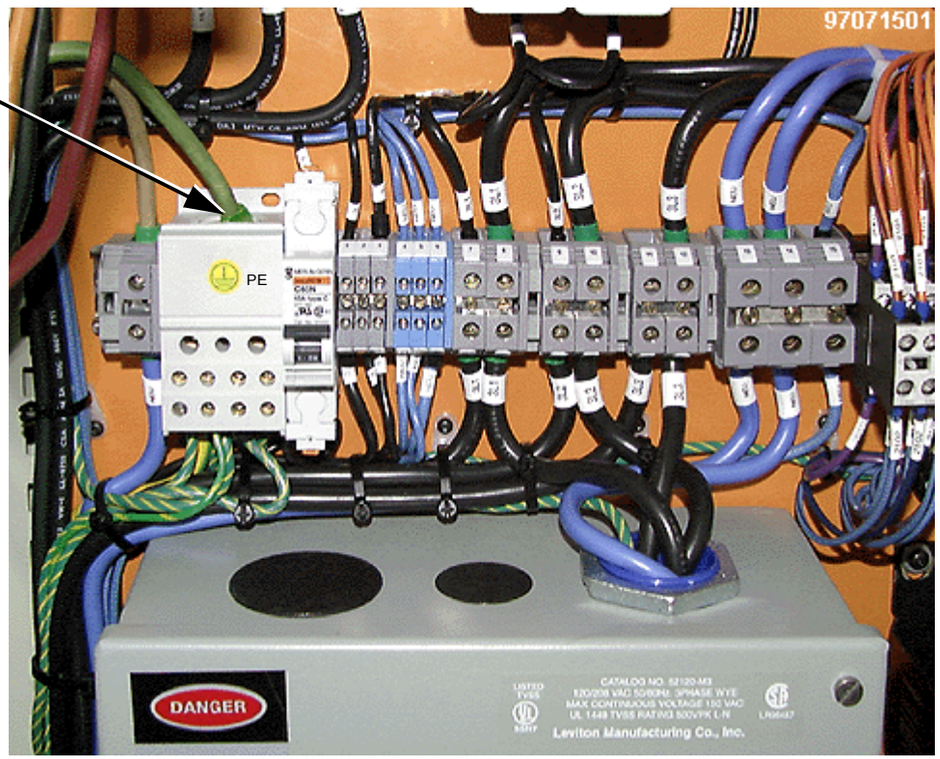


Figure 3-6. External (Protective Earth) Ground Location

GFIC

The outlet behind the Electrical Cabinet control station monitor is a Ground Fault Interrupt Circuit (GFIC). Power for the Operator side control station monitor, SysCon, light pens, and video splitter are supplied from this outlet junction box.

Grounding Rods

Electrical grounding rods are not required for the AvantGaard™ 676.

continued on next page

Electrical Hazards, continued

Ground Bonding Path

Use #10 AWG (or larger) green with yellow stripe wires to electrically bond the Main Tool (Interconnect Boxes) to the Electrical Cabinet (Main Power Panel Assembly)

[S/N 3031] This Tool was originally built with solid green colored earth ground wires in some locations. To comply with applicable CE regulations, these locations now have GRN/YEL bicolor heat shrink tubing to endmark the green earth ground wires.

Figure 3-7. Main Tool and Electrical Cabinet Ground Bonding Connections

continued on next page

Electrical Hazards, continued

Lockout / Tagout Procedure

Table 3-4 gives a sample procedure for lockout / tagout. Use this lockout / tagout procedure, or site approved lockout / tagout procedure that is in compliance with OSHA 1910-147, or other applicable regulations, before doing any maintenance or servicing requiring access to any high voltage panel assemblies, or hazardous areas of the Tool. The purpose of using a lockout / tagout procedure is to make sure that the Tool is stopped, and that all personnel are isolated from potentially hazardous areas. By locking out the equipment as described here, the Tool will be made safe for maintenance personnel from any unexpected startup or release of stored energy. Make sure the following procedure steps are strictly followed.

Table 3-4. Lockout / Tagout Procedure

Step	Instruction
1	Notify all affected employees that servicing or maintenance is required on the Tool and that during the service period, the Tool will be shut down and locked out.
2	Lockout should only be done by authorized employees. Authorized employees must be familiar with the types of hazards on each labeled panel assembly and must be trained to understand the other hazards in the Tool.
3	If the Tool is running, do the normal shut down procedures to stop wafer processing.
4	Position the main disconnect switch from ON to OFF.

continued on next page

Electrical Hazards, continued

Step	Instruction
5	Pull the lockout tab in the center of the switch. Lockout and tag the respective panel by using an approved lock. Tagout information should be labeled on lockout tags and include the operator's name, the date of lockout and a phone or extension number where the authorized tag removal person can be located.
6	To release stored pneumatic energy, shut off the pneumatic entry lockout / shutout. Push manual release button on all "heads up" valves. (4 heads on upper MP panel and 2 wafer combs on upper C2C panel.)

continued on next page

Electrical Hazards, continued

SEMI S2-91, S2-93 Guidelines

Semiconductor Equipment and Materials International, Inc. (SEMI) has identified a set of minimum performance-based environmental, health, and safety considerations that are used to identify potential hazards in the operation and maintenance of equipment for the semiconductor industry. The following S2-93 type classification guidelines are stricter than S2-91 guidelines. (S2-93 requires that power potentials and the presence of radio frequency be considered, as well as voltage potentials.) S2-93 guidelines were used while reviewing the AvantGaard™ 676 and compiling the following table. The following five types of energized electrical work are defined in S2-93.

Type 1 - Equipment is fully de-energized (electrically “cold”).

Type 2 - Equipment is energized. Live circuits are covered or insulated. Work is done at a remote location to prevent
accidental shock.

Type 3 - Equipment is energized. Live circuits are exposed and accidental contact is possible. Potential exposures are
less than 30 volts RMS, 42.2 volts peak, 240 volt-amps, and 20 Joules.

Type 4 - Equipment is energized. Live circuits are exposed and accidental contact is possible. Voltage potentials are
greater than 30 volts RMS, 42.2 volts peak, 240 volt-amps, 20 Joules, or radio frequency (rf) is present.

continued on next page

Electrical Hazards, continued

Type 5 - Equipment is energized and measurements and adjustment require physical entry into the equipment, or

equipment configuration will not allow the use of clamp-on probes.

Any procedure classified as a Type 3, 4, or 5 will be identified by a DANGER icon at the start of the procedure.

continued on next page

Electrical Hazards, continued

Type Classification

Each area in the AvantGaard™ 676 has been identified by type classification for maintenance and troubleshooting procedures. Refer to Table 3-5. Type classification for each area was determined by the most hazardous component in the area. For example, an area containing a Type 3 component and a Type 4 component would be classified as a Type 4 area.

Barriers

Component classifications were determined while all Tool power was applied, and all barriers (doors, panels, etc.) that restrict access to the areas (not to the components) were removed. It is recommended that barriers either designed into the components by the manufacturer, or added at the system level (for instance, shields over terminal blocks), not be removed during troubleshooting, unless absolutely necessary.

SpeedFam-IPEC labels all barriers concealing hazards in accordance with SEMI S1-90.

continued on next page

Electrical Hazards, continued

Tool Area Type Classification

The following table lists each Tool area, its type classification, the Type 3, 4, and 5 components in that Tool area, and the exposed potential of each component.

Table 3-5. S2-93 Tool Area Classifications

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
MP Low Voltage Panel Assemblies on Swing Panels of the Electrical Cabinet	3	CB1	24VDC
		CB2	5VDC
		F3	12VDC
		F4	12VDC
		PS1	24VDC
		Rly3	24VDC
		Rly8	24VDC
		TB5	5VDC
		TB12	12VDC
		TB12	12VAC
		TB24	24VDC
		TBI24	24VDC
		TB25	24VDC
		All Opto racks	24VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
Pad Conditioner Low Voltage Panel Assemblies on Swing Panels of the Electrical Cabinet.	3	CB1	24VDC
		CB2	5VDC
		PS1	24VDC
		Rly3	24VDC
		F3	12VDC
		TB5	5VDC
		TB12	12VDC
		TB24	24VDC
		TBI24	24VDC
		All OPTO22 Racks	24VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
Electrical Cabinet Low Voltage panels C2C Low Voltage Swing Panel Assemblies	3	CB1	24VDC
		CB2	5VDC
		F3	12VDC
		F4	12VDC
		PS1	24VDC
		Rly3	24VDC
		Rly4	24VDC
		TB5	5VDC
		TB12	12VDC
		TB-12	12VDC
		TB24	24VDC
		TBI24	24VDC
		All Opto 22 racks	24VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
Optional Brookside Endpoint Low Voltage Panel Assembly on Right Swing Panel of the Electrical Cabinet.	3	Advantech PCLD785	5VDC
		Advantech PCLD-8115	5VDC
		PCL-818L	5VDC
		CB1	24VDC
		CB2	5VDC
		F3	12VDC
		F4	12VDC
		TB1	5VDC
		TB2	12VDC
		TB3	24VDC
		TB4	24VDC
		TB8	5VDC
		TB9	5VDC
		TB10	12VDC
		Rly1	5VDC and 24VDC
		Entrelec 020	5VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
Optional Luxtron Endpoint Low Voltage Panel on right swing panel of the Electrical Cabinet	3	TB1	24VDC
		OPTO Board	24VDC
Optional Filmetrics Endpoint Low Voltage Panel on right swing panel of the Electrical Cabinet	3	F76 Light Source	24VDC
		PS1	5VDC
		TB2 (1-2)	5VDC
		All OPTO 22 Racks	24VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
MP High Voltage Panel Assemblies - behind Swing Panels in the Electrical Cabinet	4	VF1	208VAC
		Rly2	24VDC
		Rly2	110VAC
		Rly4	24VDC
		Rly4	208VAC
		FWF3016L	208VAC
		TB1	110VAC
		TB2	110VAC
		TB3	110VAC
		OL1	208VAC
		OL2	208VAC
		M1	110VAC
		M2	110VAC
		M3	110VAC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
Pad Conditioner High Voltage Panel Assemblies - behind Swing Panel in the Electrical Cabinet	4	CB7	110VAC
		CB30 (Pad Conditioner 2 panel only)	110VAC
		TB280 Org	24VDC
		TB-EP	110VAC
		TS2	110VAC
		Slo-Syn	110VAC
		Slo-Syn	90VDC
		KV-300 (Pad Conditioner 2 panel only)	24VDC
C2C High Voltage Panel Assembly behind right swing panel in Electrical Cabinet	4	CB7	110VAC
		Power Supply (Hine)	110VAC and 24VDC
		Robot Controller (Genmark)	110VAC
		TB1 (Hine)	24VDC
		TB4	110VAC
		TBCO79	24VDC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
High Voltage area in lower middle Section of the Electrical Cabinet	4	CB1	208VAC
		CB8	110VAC
		CB10	110VAC
		CB11	110VAC
		CB13	24VAC
		CB14	24VDC
		CB15	110VAC
		CB16	110VAC
		Cooling Fans (2) Option	24VAC
		SF1624	208VAC
		100-A60NJ3	24VAC
		100-A6ONJ3	208VAC
		IC115	110VAC
		TB1 (1-3)	110VAC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
High Voltage area in lower middle Section of the Electrical Cabinet (continued)	4	TB1 (7-8)	110VAC
		TB1 (9-10)	110VAC
		TB1 (11-12)	110VAC
		TB1 (16-18)	24VAC
		TB1 (19-22)	24VDC
		Power Conditioner	110VAC
		Rly1	24VDC
		T1	110VAC
		T1	24VAC

continued on next page

Electrical Hazards, continued

Tool Area	Type Classification of Area	Type 3, 4, & 5 Components	Exposed Potential of Components
High Voltage Area in bottom middle section of the Electrical Cabinet	4	-12VDC Power Supply	110VAC
		-12VDC Power Supply	12VDC
		12VDC Power Supply	110VAC
		12VDC Power Supply	12VDC
		5VDC Power Supply	110VAC
		5VDC Power Supply	5VDC
		24VDC Power Supply	110VAC
		24VDC Power Supply	24VDC
		TB (1-7)	5VDC
		TB (8-14)	12VDC
		TB (15-21)	12VDC
		TB (22-28)	24VDC
		TB1 (1-3) for Line Filter	208VAC

Chemical Hazards

Introduction Before operating the Tool, maintenance personnel and Tool operators should read and understand the following chemical hazards related to the AvantGaard™ 676 components, assemblies, and systems.

pH ranges pH ranges of 2-13 are the generally compatible with Tool hardware materials, surfaces, and consumables. pH ranges below 2, should be considered corrosive to certain hardware surfaces and materials, requiring consultation with SpeedFam-IPEC Engineering. Material Safety Data Sheets (MSDS) should be referred to and reviewed by user.

Slurry

CAUTION - Do not get slurry on your skin or in your eyes. Use protective eye wear and clothing when working with any slurry mixture. Wear an approved respirator for respiratory protection during any cleaning procedures. Colloidal silica slurry is a mild irritant to the skin and eyes. If the slurry mixture contacts your skin or eyes, flush the contacted area with water for 15 minutes and refer to the MSDS.

CAUTION - Évitez tout contact de la boue avec votre peau ou vos yeux. Utilisez des lunettes et des vêtements protecteurs quand vous manipulez le mélange boueux. Portez un appareil respiratoire approuvé pour protéger votre respiration pendant toute procédure de nettoyage. La boue de silice colloïdale est un irritant léger de la peau. Si le mélange boueux entre en contact avec votre peau ou vos yeux, nettoyez la zone touchée avec de l'eau pendant 15 minutes et consultez la fiche signalétique de sécurité.

continued on next page

Chemical Hazards, continued

VORSICHT - Die Suspension darf nicht mit Haut und Augen in Kontakt kommen. Beim Umgang mit allen Arten der Suspensionsmischung müssen Augenschutz und Schutzbekleidung getragen werden. Zum Atemschutz ist während aller Reinigungsverfahren eine zugelassene Atemschutzmaske zu tragen. Die kolloidale Siliziumsuspension wirkt leicht reizend auf Augen und Haut. Falls die Mischung mit Augen oder Haut in Berührung kommt, die betroffene Stelle 15 Minuten lang mit Wasser spülen und auf das Sicherheitsdatenblatt Bezug nehmen.

ПрЕДОСТЕрЕЖЕНИЕ - Необходимо предохранять кожу и глаза от попадания суспензии. При работе с суспензией необходимо носить защитные очки и защитную одежду. Во время чистки следует носить аттестованный респиратор. Суспензия коллоидного кремнезема вызывает небольшое раздражение кожи и глаз. Если такая суспензия попала на кожу или в глаза, следует промывать пораженный участок кожи или глаза в течение пятнадцати минут, а затем действовать согласно рекомендациям, содержащимся в справочнике по безопасному использованию материалов.

Report Any of the Following

- Irritation or burning of the respiratory system
- Pulmonary Edema
- Lung Inflammation
- Headache
- Coughing
- Difficulty Breathing
- Dizziness
- Chest Pains or Respiratory Failure
- Irritation of the tissues contacted. Chronic exposure to this compound can cause dermatitis.

Chemical Hazards, continued

CAUTION - Use protective eye wear and rubber gloves during wafer polisher operation and cleaning. Chemicals used during the wafer polishing process are hazardous to skin and eyes.

ATTENTION - Utilisez des lunettes protectrices et des gants de caoutchouc pendant le fonctionnement du polisseur de tranches et son nettoyage. Les produits chimiques utilisÈs pendant le processus de polissage des tranches sont dangereux pour la peau et les yeux.

VORSICHT - WÄHREND DES BETRIEBS UND DER REINIGUNG DER WAFER-POLIERMASCHINE AUGENSCHUTZ UND GUMMIHANDSCHUHE TRAGEN. DIE BEI DER WAFER-POLIERUNG VERWENDETEN CHEMIKALIEN KÖNNEN HAUT UND AUGEN GEFÄHRDEN.

ПрЕДОСТЕрЕЖЕНИЕ - Во время полирования и чистки пластин необходимо носить защитные очки и резиновые перчатки. Химикаты, применяемые в процессе полирования пластин, представляют опасность для кожи и глаз.

Personal Protective Equipment

- Wear Acid Gloves
- Acid Apron
- Safety Goggles/Face Mask/Breathing Apparatus

continued on next page

Chemical Hazards, continued

CAUTION - Make sure proper safety procedures and precautions are obeyed for the chemicals used at your site. Any change from the SpeedFam-IPEC recommended baseline chemistries must be analyzed by the customer for hazard potential. Consult SpeedFam-IPEC authorized personnel for any baseline chemistry changes.

ATTENTION - Assurez-vous que l'on respecte les bonnes procédures et précautions de sécurité relatives aux produits chimiques utilisés dans votre site. Le client doit faire une analyse des possibilités de danger pour tout changement par rapport aux produits chimiques de référence recommandés par l'SpeedFam-IPEC. Consultez le personnel autorisé de l'SpeedFam-IPEC pour tout changement par rapport aux produits chimiques de référence.

continued on next page

Chemical Hazards, continued

VORSICHT - Stellen Sie sicher, daß an Ihrer Arbeitsstätte die korrekten Sicherheits- und Vorsichtsmaßnahmen für die benutzten Chemikalien angewandt werden. Der Kunde muß jegliche Abweichungen von den durch die SpeedFam-IPEC empfohlenen Baseline-Chemikalien auf ein mögliches Risiko analysieren lassen.

ПрЕДОСТЕрЕЖЕНИЕ - Необходимо обеспечить соблюдение надлежащих правил и мер предосторожности при работе с химическими веществами, применяемыми на вашем предприятии. В том случае, если возникла необходимость во внесении каких-либо изменений в базовый химический состав, рекомендованный компанией SpeedFam-IPEC, необходимо дать оценку рискам, связанным с внесением такого изменения. Перед тем, как внести какое-либо изменение в базовый химический состав, следует проконсультироваться с уполномоченными сотрудниками компании SpeedFam-IPEC.

Fluids and Slurries

The fluids used in the AvantGaard™ 676 are DI Water and polishing slurries. DI Water is used for wafer wetting, slurry dilution, purging and is the solvent for all chemicals used in the Tool. The polishing slurries consist of chemicals dissolved in DI Water and abrasives, usually Aluminum Oxide (Alumina) and Silicon Dioxide (Silica). Metal polishing slurries are typically acidic, and oxide polishing slurries are typically alkaline.

continued on next page

Chemical Hazards, continued

Chemical Disposal

CAUTION - Obey all local, regional, and site-specific regulations for chemical disposal. A potential safety hazard exists if incompatible chemicals are disposed of at the same time. Exposure can cause sickness or loss of life.

ATTENTION - Respectez tous les règlements locaux, régionaux et particuliers au site, relatifs à l'évacuation des produits chimiques. Il existe un danger potentiel de sécurité si des produits chimiques incompatibles sont évacués ensemble. Ces déchets peuvent exploser en occasionnant des blessures ou des décès.

VORSICHT - Befolgen Sie alle lokalen, regionalen und standortspezifischen Vorschriften für die Entsorgung der Chemikalien. Bei gleichzeitiger Entsorgung von miteinander unverträglichen Chemikalien kann ein Sicherheitsrisiko entstehen. Eine Exposition kann gesundheitsschädlich sein oder zum Tod führen.

ПрЕДОСТЕрЕЖЕНИЕ - Необходимо соблюдать все местные, региональные и заводские правила удаления использованных химических веществ. Если удалять несовместимые химические вещества в одно и то же время, при этом возникает угроза безопасности. Воздействие таких веществ может привести к заболеваниям или к смертным случаям со смертельным исходом.

Chemical Hazards, continued

CAUTION - The AvantGaard™ 676 is not designed to use flammable chemicals or be operated in an explosive atmosphere.

ATTENTION - L'AvantGaard™ 676 n'est pas conçu pour utiliser des produits chimiques inflammables ou pour fonctionner dans une atmosphère explosive.

VORSICHT - Der AvantGaard™ 676 darf nicht mit entflammbaren Chemikalien oder in einer explosiven Atmosphäre betrieben werden.

ПрЕДОСТЕрЕЖЕНИЕ - Оборудование AvantGaard™ не рассчитано на работу с использованием воспламеняющихся химических веществ или во взрывоопасной атмосфере.

continued on next page

Chemical Hazards, continued

Waste Disposal Methods

CAUTION - Refer to waste disposal methods on site supplied Material Safety Data Sheets (MSDS) when disposing of any chemicals or consumables. Process specific chemicals should be evaluated for potential hazards and disposed of in compliance with local and/or OSHA and Environmental Protection Agency standards.

ATTENTION - Référez-vous aux méthodes d'évacuation des déchets indiquées sur les feuilles signalétiques de sécurité de produit fournies sur le site, pour évacuer tout produit chimique ou produit inflammable. Pour évacuer des produits chimiques particuliers, vous devez évaluer leur danger potentiel et les évaluer conformément aux normes locales et/ou de l'OSHA et de l'Agence de protection de l'environnement.

VORSICHT - Beachten Sie beim Entsorgen von Chemikalien oder Verbrauchsmaterialien die von Ihrer Arbeitsstätte zur Verfügung gestellten Sicherheitsdatenblätter. Die verfahrensspezifischen Chemikalien sind auf mögliche Gefahren zu bewerten und müssen entsprechend der jeweiligen örtlichen und/oder behördlichen Arbeits- und Umweltschutzvorschriften entsorgt werden.

ПрЕДОСТЕрЕЖЕНИЕ - Необходимо удалять химические вещества или расходуемые материалы с помощью методов удаления отходов производства, указанных в применяемом на предприятии справочнике по безопасному использованию материалов. Следует оценить риски, связанные с использованием определенных химических веществ в производственном процессе, и их следует удалять в соответствии с местными нормами и/или нормами, установленными Управлением по безопасности труда и охране здоровья и Управлением по охране окружающей среды.

Chemical Hazards, continued

Deionized Water

CAUTION - Do not get DI water on your skin. DI (deionized) water will leach the ions out of your body and can cause sickness or loss of life if consumed.

ATTENTION - Évitez tout contact d eau déionisée avec votre peau. L eau déionisée attire les ions de votre corps et peut causer la maladie ou même la mort si vous la consommez.

CAUTION - Kein deionisiertes Wasser mit der Haut in Berührung kommen lassen. Deionisiertes Wasser löst die Ionen aus Ihrem Körper heraus und kann bei Verschlucken zur Krankheit oder sogar zum Tod führen.

ПрЕДОСТЕрЕЖЕНИЕ - Необходимо оберегать кожу от попадания деионизированной воды. Деионизированная вода вызывает выщелачивание ионов из организма, а при попадании в организм она может вызвать заболевание или смерть.

continued on next page

Chemical Hazards, continued

Ventilation/ Scrub Exhaust

The Tool should be connected to a scrub exhaust system at the following three connections points. The primary and secondary exhaust ventilation systems should be monitored for static pressure or flow, and have a Magnahelic alarm.

Exhaust Location	Description
System Scrub	1.5” (38.1 cm) diameter connection located at the lower chase side of the Tool. These lines from each head remove slurry fumes as well as collecting pneumatic exhaust. (flow approx. 50 SCFM)
Tool Base Evacuation	6.0” (15.2 cm) diameter connection located in the center of the bottom of the Tool. Gives a general evacuation of the lower Tool base area. (flow approx. 300 SCFM)

Material Safety Data Sheets

CAUTION - Your company must have a current MSDS readily available for each chemical used with the wafer polisher.

ATTENTION - Ce symbole est utilisé sur les étiquettes dans la machine pour identifier l'emplacement de la mise à la terre extérieure (terre protectrice).

VORSICHT - Ihre Firma muß für jede mit der Wafer-Poliermaschine benutzte Chemikalie ein aktuelles Sicherheitsdatenblatt bereithalten.

ПрЕДОСТЕрЕЖЕНИЕ - На вашем предприятии должен быть обеспечен легкий доступ к действующему справочнику по безопасному использованию материалов, содержащему необходимую информацию о каждом из химических веществ, используемых в машине для полирования пластин.

Material Safety Data Sheets (MSDS)

Figure 3-8 on page 3-84 shows a typical Material Safety Data Sheet (MSDS).

continued on next page

Material Safety Data Sheets, continued

Material Safety Data Sheet

DATE ISSUED	DATE REVISED	EMERGENCY TELEPHONE NUMBER

SECTION I - IDENTIFICATION OF MATERIAL

CHEMICAL NAME OR COMPOSITION

TRADE NAME & SYNONYMS

HAZARD RATING (FIRE / HEALTH / REACT.)

CHEMICAL FAMILY | MOLECULAR FORMULA

in Water

SECTION II - SIGNIFICANT COMPONENTS AND CONTAMINANTS

CAS NO.	COMPONENT	PERCENT	PERMISSIBLE EXPOSURE LIMIT	ACGIH Total Dust

SECTION III - PHYSICAL DATA

PHYSICAL CHARACTERISTICS

BOILING POINT	FREEZING POINT	SPECIFIC GRAVITY (WATER = 1.0)

VAPOR PRESSURE (mm OF MERCURY) | pH

VAPOR DENSITY (AIR = 1) | SOLUBILITY IN WATER

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (SPECIFY METHOD)

FIRE EXTINGUISHING MEDIA

SPECIAL FIRE FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

NA

SECTION V - HEALTH HAZARD DATA

TOXICITY

EFFECTS OF OVEREXPOSURE: ACUTE; CHRONIC; MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

EMERGENCY AND FIRST AID PROCEDURES

SECTION VI - REACTIVITY DATA

GENERAL REACTIVITY

INCOMPATIBILITY (MATERIALS TO AVOID)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION | CONDITIONS TO AVOID

SECTION VII - SPILL PROCEDURES / DISPOSAL REQUIREMENTS

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

WASTE DISPOSAL METHOD

CONTAINER DISPOSAL

SECTION VIII - SPECIAL PROTECTION INFORMATION (SPECIFY IN DETAIL)

EYE PROTECTION | GLOVES

RESPIRATORY

VENTILATION | OTHER

NA

SECTION IX - SPECIAL PRECAUTIONS

Storage Requirements:

Labeling:

SECTION X - SHIPPING REGULATIONS (D.O.T. NOMENCLATURE)

SECTION XI - REGULATORY INFORMATION

Figure 3-8. Material Safety Data Sheet - Front and Rear (Typical)

Cleaning and Spills

Introduction Remove slurry from the pumps, piping, and process surfaces by flushing with water. Line pressure in the pumps is limited to the head pressure generated by raising the slurry 24 inches to the process heads, approximately 1-2 pounds.

Follow Safety Guidelines and Fab Specifications posted at production site. Sites should make MSDS (Material Safety Data Sheets) documentation easily available for all chemical ingredients and handling precautions.

continued on next page

Cleaning and Spills, continued

Maintenance Cleaning

CAUTION - Do not use solvents to clean dried slurry. Slurry compound can be slightly alkaline. Wear an approved respirator for respiratory protection during any cleaning procedures. Using solvents can cause the suspended chemicals to precipitate and release hazardous vapors.

ATTENTION - N'utilisez pas de solvants pour nettoyer la boue sÈchÈe. La boue peut Ítre lÈgËrement alcaline. Portez un appareil respiratoire approuvÈ pour protÈger vos poumons pendant toute procÈdure de nettoyage. L'utilisation de solvants peut causer une prÈcipitation de produits chimiques en suspension et un dÈgagement de valeurs dangereuses.

CAUTION - Zur Reinigung der getrockneten Suspension keine Lösungsmittel verwenden. Die Suspension kann leicht basisch sein. Zum Atemschutz bei allen Reinigungsverfahren eine zugelassene Atemschutzmaske verwenden. Lösungsmittel können eine Absetzung der suspendierten Chemikalien verursachen, wodurch gefährliche Dämpfe freigesetzt werden können.

ПрЕДОСТЕрЕЖЕНИЕ - Не следует удалять засохшую суспензию с помощью растворителей. Суспензия может быть слегка щелочной. Во время чистки обязательно необходимо носить аттестованный респиратор. При использовании растворителей может произойти осаждение взвешенных химических веществ с выделением опасных паров.

Cleaning and Spills, continued

Controlling Spills

The Tool has a sloped drain monitored by a leak detection device. The drain is 0.50 inch (1.27 cm) diameter and the catch pan is 15.8 cubic feet (0.442 m^3). The leak detection system, located in the lower catch pan, will sound a system alarm if activated by leaking fluids. Follow any applicable Safety Guidelines and Fab Specifications posted at the production site. All customer sites must supply MSDS (Material Safety Data Sheet) documentation for all chemicals used at the site.

Airborne Noise Hazards

Introduction The following table lists the airborne noise emission levels recorded at 1 meter from the Tool. For a working shift of 8 hours, a steady sound level or 90 dBA is the maximum generally permitted, with marked reduction in allowable exposure times for higher sound levels. Use appropriate hearing protection when working near the Tool.

Table 3-6. AvantGaard™ 676 Sound Levels

Description	Load Station	Front CRT
Ambient (dBA)	67	66
Measurement (dBA)	71	73
ANSI S1.13 Correction Factor	-2.2	-1.0
Resulting Value (dBA)	68.8	72

Use the following examples to compare the noise level of the Tool with the noise levels in common indoor situations.

continued on next page

Airborne Noise Hazards, continued

Table 3-7. Noise Level Examples

Situation	Typical Noise Level (dBA)
Meeting and conference rooms	42 dBA
Private offices and small meeting rooms	38 - 47 dBA
Supervisor’s offices and reception rooms	38 - 52 dBA
Large offices and cafeterias	42 - 52 dBA
Laboratories, drafting rooms, and general office areas	47 - 56 dBA
Maintenance shops, computer rooms, and washrooms	52 - 61 dBA
Control and electrical equipment rooms	56 - 66 dBA
Manufacturing areas and foremen’s offices	66 dBA

General Hazards

Compliance Table 3-8 identifies AvantGaard™ 676 compliance to the various hazards and conditions.

Table 3-8. General Hazards

Hazard / Condition	Compliance / Responsibility
Fire Protection	Fire protection is controlled by the customer / facility and should comply with site posted regulations.
General/Facilities	Facilities safety issues are controlled by the customer / facility and should comply with site posted regulations.
Emergency Procedures	Emergency Procedures are controlled by the customer / facility and should comply with site posted regulations.
Chemical/Gas Delivery Systems	Chemical/Gas Delivery Systems are controlled by the customer / facility and should comply with site posted regulations.
Gas Detection/Alarms	Gas Detection/Alarms are controlled by the customer / facility and should comply with site posted regulations.
Process Effluent Handling Systems	Process Effluent Handling Systems are controlled by the customer / facility and should comply with site posted regulations.
Chemical Disposal Systems	Chemical Disposal Systems are controlled by the customer / facility and should comply with site posted regulations.
Industrial Hygiene	Industrial Hygiene is controlled by the customer / facility and should comply with site posted regulations.
Radiation	The AvantGaard™ 676 does not emit hazardous radiation.

continued on next page

General Hazards, continued

Ergonomics The AvantGaard™ 676 complies with the requirements of the SEMI S2-93 Safety Guidelines for Semiconductor Manufacturing Equipment and complies with the applicable European Community (CE) requirements.

Laser Hazards

DANGER - AVOID DIRECT EYE EXPOSURE FROM THE LASER. CONTINUOUS DIRECT EYE EXPOSURE TO THE LASER BEAM MAY CAUSE EYE INJURY.

DANGER - ÉVITEZ L'EXPOSITION DIRECTE D'OEIL DU LASER. L'EXPOSITION DIRECTE CONTINUE D'OEIL AU RAYON LASER PEUT CAUSER DES DOMMAGES D'OEIL.

GEFAHR - VERMEIDEN SIE DIREKTE AUGE BERÜHRUNG VOM LASER. UNUNTERBROCHENE DIREKTE AUGE BERÜHRUNG ZUM LASERSTRAHL KANN AUGE BESCHÄDIGUNGEN VERURSACHEN.

ОПАСНОСТЬ - Необходимо защищать глаза от прямого воздействия лазерного луча. Продолжительное прямое воздействие лазерного луча может повредить глаз.e5

Compliance Avoid direct eye exposure from laser. The beam is emitted from an aperture at the front of the laser. This laser is supplied with the optional tool kit and is used for calibration and alignment procedures on the AvantGaard™ 676. This product conforms to all applicable standards of subchapter J,21 CFR CH 1.

Table 3-9. Laser Specifications

Beam Size @ Module Face	Energy Level	Wave Length	Class Type	Laser Type
3.0mm Dia.	4.2 mW	635 nm	Class IIIa	Red Laser Diode

S2-93 and CE Compliance

Compliance The AvantGaard™ 676 complies with the requirements of the SEMI S2-93 Safety Guidelines for Semiconductor Manufacturing Equipment and complies with the applicable European Community (CE) requirements.

Moving the Tool

WARNING - MAKE SURE SUFFICIENTLY TRAINED PERSONNEL AND PROPER EQUIPMENT ARE USED TO MOVE THE TOOL OR ELECTRICAL CABINET. THESE COMPONENTS ARE VERY HEAVY AND CAN CRUSH PERSONNEL OR CAUSE FACILITY DAMAGE IF HANDLED INCORRECTLY.

AVERTISSEMENT - ASSUREZ-VOUS QUE LE PERSONNEL SUFFISAMMENT QUALIFIÉ ET LE MATÉRIEL APPROPRIÉ SONT HABITUÉS POUR DÉPLACER MACHINE OU LE MODULE ÉLECTRIQUE. CES COMPOSANTS SONT TRÈS LOURDS ET PEUVENT ÉCRASER LE PERSONNEL OU ENDOMMAGER SERVICE SI MANIPULÉS INEXACTEMENT.

DANGER - ÜBERPRÜFEN SIE, DAß GENUG AUSGEBILDETES PERSONAL UND KORREKTE AUSRÜSTUNG BENUTZT SIND, DAS MASCHINE ODER DEN ELEKTRISCHEN SCHRANK ZU VERSCHIEBEN. DIESE BESTANDTEILE SIND SEHR SCHWER UND KÖNNEN PERSONAL ZERQUETSCHEN ODER TEILDIENSTBESCHÄDIGUNG VERURSACHEN, WENN SIE FALSCH ANGEFAßT WERDEN.

ПрЕДУПрЕЖДЕНИЕ - Если возникла необходимость в перемещении установки или электрошкафа, такая операция должна осуществляться в достаточной степени обученным персоналом. Эти изделия являются очень тяжелыми, и, если их перемещать ненадлежащим образом, они могут раздавить персонал или повредить оборудование или другое имущество предприятия.

continued on next page

Moving the Tool, continued

Moving the Main Tool

The Main Tool weighs approximately 6,500 lbs (2,948 kg). It can be lifted by any location on the bottom surface, except within 12" (30.5 cm) of the bottom center of the frame. Also, at the bottom right hand corner of the chase side of the Tool, an interlock wire is exposed. Be careful not to damage this wire if the Tool must be moved.

The Center-of-Gravity is very near to the geometric center of the Main Tool.

continued on next page

Moving the Tool, continued

Side loads can only be applied to the lower 3" (7.62 cm) of the frame on the front and lower 6" (15.2 cm) of the frame, up to 10" (25.4 cm) from the corners on the sides. SpeedFam-IPEC recommends that air bearings, or equivalent, are used to move and position the Main Tool.

Moving the Electrical Cabinet

The Electrical Cabinet weighs approximately 3,500 lbs (1,588 kg). Do not apply side loads to the cabinet at any location (all surfaces are sheet metal). SpeedFam-IPEC recommends that roller dollies, or equivalent, are used to move and position the Electrical Cabinet.

Chapter 4

Unloading and Connection Procedures

Contents This chapter contains the following topics:

Topic	See Page
Moving Procedures	4-2
Contents of Shipping Crates	4-3
Shipping and Storage Requirements	4-4
Receiving Inspection	4-5
Unloading	4-6
Uncrating Procedures	4-7
Move Main Tool and Electrical Cabinet Into Bay	4-9
Placement In FAB	4-10
SpeedFam-IPEC Installation Support	4-14
Required Support Equipment	4-15
Facilities Connection Procedures	4-17
Electrical Ratings	4-18
Facility Fluids Connections	4-19
Facilities Connections Checklists	4-20

Moving Procedures

Introduction

Before the tool is cleaned and packaged, all tool components and assemblies pass a detailed inspection by SpeedFam-IPEC. Once the tool is acceptable and has been cleaned and packaged, the tool is shipped to the installation site. This chapter gives a timetable for delivery and setup, unpacking and inspection procedures, and moving procedures.

Moving the Tool

Before a tool is delivered to the installation site, customer contractors should do all site preparation tasks relating to the installation and tool movement procedures.

NOTE: **It is recommended this chapter be read thoroughly before unloading and moving the equipment.**

Contents of Shipping Crates

Shipping Crates

Table 4-1 lists the contents of the shipping crates. Use this table, as required, to make sure all shipping crates, and tool components, have been received.

Table 4-1. Shipping Crate Checklist

Contents	Number Of Crates	Check Off
Main Tool	1	
Electrical Cabinet	1	
Accessories: • monitors (Quantity 2) • monitor base and cover • all interconnect cables (Quantity 13) • hoists (Quantity 2) • frame collars (Quantity 2) • stainless steel collar inserts (Quantity 2) • chains (Quantity 2) • hooks (Quantity 2) • large clevis (Quantity 2) • small clevis (Quantity 2) • Delrin® hoist rests (Quantity 2) • Source Inspection Documentation Packet	1	

Shipping and Storage Requirements

Limits

Table 4-2 describes the acceptable temperature and humidity levels recommended during transportation and storage.

Table 4-2. Acceptable Temperature and Humidity Levels

Description	Specification
Temperature	45°F (7°C) to 122° (50°C)
Humidity	10% to 90%

NOTE: **Typically, it is not necessary to control humidity other than preventing moisture from collecting on the tool surfaces and components.**

Receiving Inspection

Inspect Crates Before accepting the tool from the freight carrier, inspect the shipping crates for damage. The packing lists on the crates give the freight numbers. Write down a brief description of any external damage to the crates on the carrier's waybill. If any damage is detected, file a damage report with the carrier and have the driver sign it**.**

NOTE: **Do not accept a damaged shipment without a signed damage report. Failure to follow this procedure may remove responsibility for shipping damage from the carrier and supplier.**

Tip-N-Tell indicators Check the condition of the Tip-N-Tell indicators to make sure the crates have not been tilted or tipped in a position that may damage the contents. Any damage found while unpacking should be documented and reported to SpeedFam-IPEC.

Unloading

Unloading the Main Tool

The Main Tool weighs approximately 6,500 lbs (2948 kg). It can be lifted by any location on the bottom surface, **except** within 12 inches (30.5 cm) of the bottom center of the frame. Also, at the bottom right hand corner of the chase side of the tool, an interlock wire is exposed. Be careful not to damage this wire during the move.

The Center-of-Gravity is very near to the geometric center of the Main Tool. (Refer to Table 2-1 on page 2-3)

Side loads can only be applied to the lower 3 inches (7.62 cm) of the frame on the front and lower 6 inches (15.2 cm) of the frame, up to 10 inches (25.4 cm) from the corners on the sides.

SpeedFam-IPEC recommends that air bearings, or equivalent, are used to move and position the Main Tool.

Unloading the Electrical Cabinet

The Electrical Cabinet weighs approximately 3,500 lbs (1588 kg). Do not apply side loads to the cabinet at any location (all surfaces are sheet metal). SpeedFam-IPEC recommends that roller dollies, or equivalent, are used to move and position the Electrical Cabinet.

Uncrating Procedures

Table 4-3. Uncrating Procedures

Step	Instruction
1	Use a 7/16 inch socket wrench to remove the bolts from around the edge of the lid on the Main Tool crate, then lift off the lid.

WARNING - USE EXTREME CAUTION WHEN REMOVING THE LAST 7/16 INCH BOLTS TO MAKE SURE THE SIDE OF THE CRATE DOES NOT FALL ON ANYONE.

2	Use a 7/16 inch socket wrench to remove the bolts from the vertical edges of the “Lift Only” side of the crate.
3	Remove the “Lift Only” side of the crate.
4	Use a forklift with the correct weight capacity to pick up and remove the Main Tool from the crate. Refer to “Unloading the Main Tool” on page 4-6 for lifting restrictions.
5	Use a 3/4 inch socket wrench to remove the bolts holding the 2” x 6” shipping board to each end of the Main Tool.
6	Locate the feet and plates for the bottom edge cover in the Main Tool crate.
7	Install the four feet in the bottom of the Main Tool, then lower to the floor.

Continued on next page

Uncrating Procedures, continued

Step	Instruction
8	Use a 7/16 inch socket wrench to remove the bolts from around the edge of the lid on the Electrical Cabinet crate, then lift off the lid.

WARNING - USE EXTREME CAUTION WHEN REMOVING THE LAST 7/16 INCH BOLTS TO MAKE SURE THE SIDE OF THE CRATE DOES NOT FALL ON ANYONE.

9	Use a 7/16 inch socket wrench to remove the bolts from the vertical edges of the “Lift Only” side of the crate.
10	Remove the “Lift Only” side of the crate.
11	Use a forklift with the correct weight capacity to pick up and remove the Electrical Cabinet from the crate. Refer to “Unloading the Electrical Cabinet” on page 4-6 for lifting restrictions.
12	Use a 7/16 inch socket wrench to remove the bolts from around the edge of the lid on the Accessories crate, then lift off the lid.
13	Remove the packing materials, tool components, and accessories.

Move Main Tool and Electrical Cabinet Into Bay

Move into Bay

Table 4-4. Move Main Tool And Electrical Cabinet Into Bay

Step	Instruction
1	Move the Electrical Cabinet, Main Tool, and the tool components and accessories outside the final wipe down area.
2	Remove all stretch wrap and black plastic sheeting, then wipe down the tool components.
3	Move the tool components into final wipe down area.
4	Use dollies, or equivalent, to move the Electrical Cabinet near the prepared installation location.
5	Use air bearings, or equivalent, to move the Main Tool near the prepared installation location.

Placement In FAB

Table 4-5. Placement In Fab

Step	Instruction
1	Position the Electrical Cabinet on its pedestal.
2	Use four M12 x 40 bolts to secure the Electrical Cabinet to the pedestal.
3	Position the Main Tool on its pedestal so the front (Operators side) of the Main Tool is flush with the bay wall.
4	Adjust the four leveling feet, as required, so the bottom of the Main Tool is approximately 3.25 inches (8.256 cm) above the floor.
5	Install the lower front stainless steel trim strip. The bottom of the SS strip should be approximately 1.5 inches (3.81 cm) above the floor.

Continued on next page

Placement In FAB, continued

Level Main Tool

Step	Instruction
6	Position a 6 inch bubble level on the top of one of the four polish heads.
7	Use a 3/4 inch wrench to adjust the Main Tool feet, as required, until the polish head is level to 0.01inch (0.003 cm) per foot, when measured from front to back and side to side along the depth and width axis of the tool.
8	Repeat the leveling procedure on each polish head until the results are consistent and no additional adjustments are required.
9	Tighten the jam nuts to lock the position of the leveling feet when the Main Tool level is in limits.
10	Use a standard Z clip seismic restraint, if required, to attach each of the four leveling feet to the pedestal. Refer to Figure 4-1 and Figure 4-2 for typical seismic restraint mounting information.

NOTE: **The Z clip seismic restraints, or equivalent, should have a maximum of one inch clearance from the under side of the Main Tool frame.**

Continued on next page

Placement In FAB, continued

Seismic Restraint Mounting

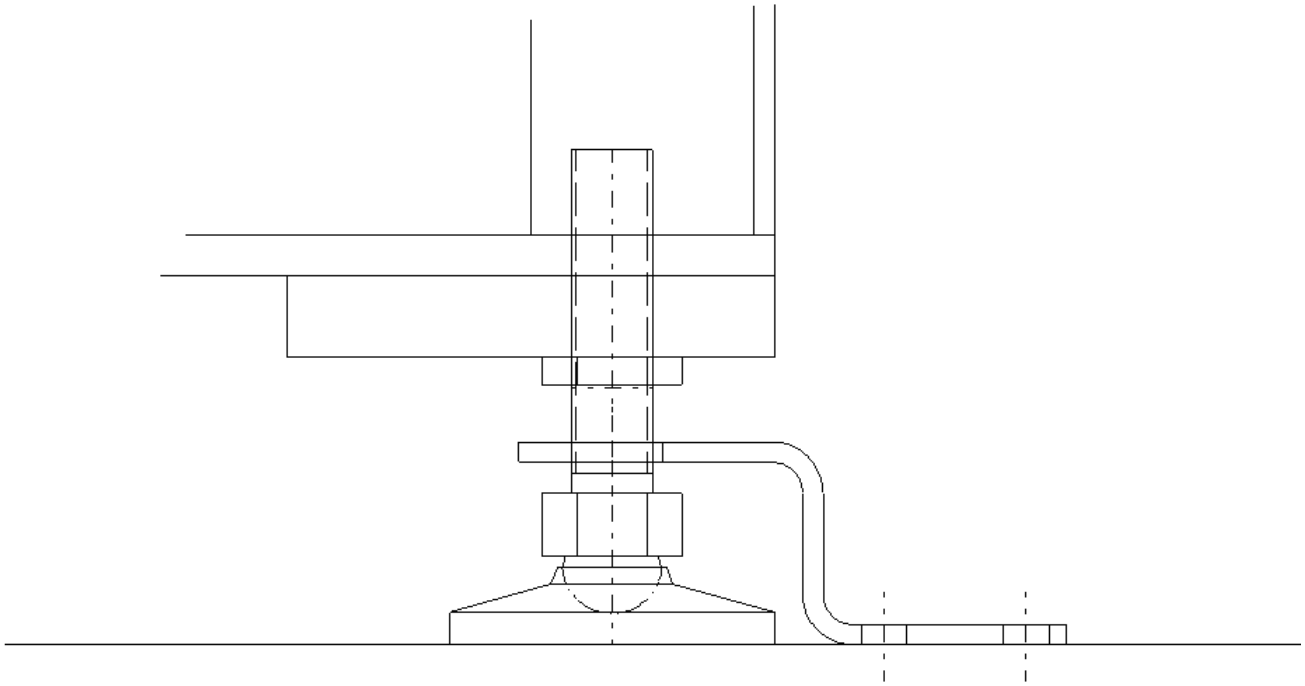


Figure 4-1. Typical Seismic Restraint Mounting

Continued on next page

Placement In FAB, continued

Mounting

Position each seismic restraint so the opening is facing outward from the Main Tool as shown in Figure 4-2.

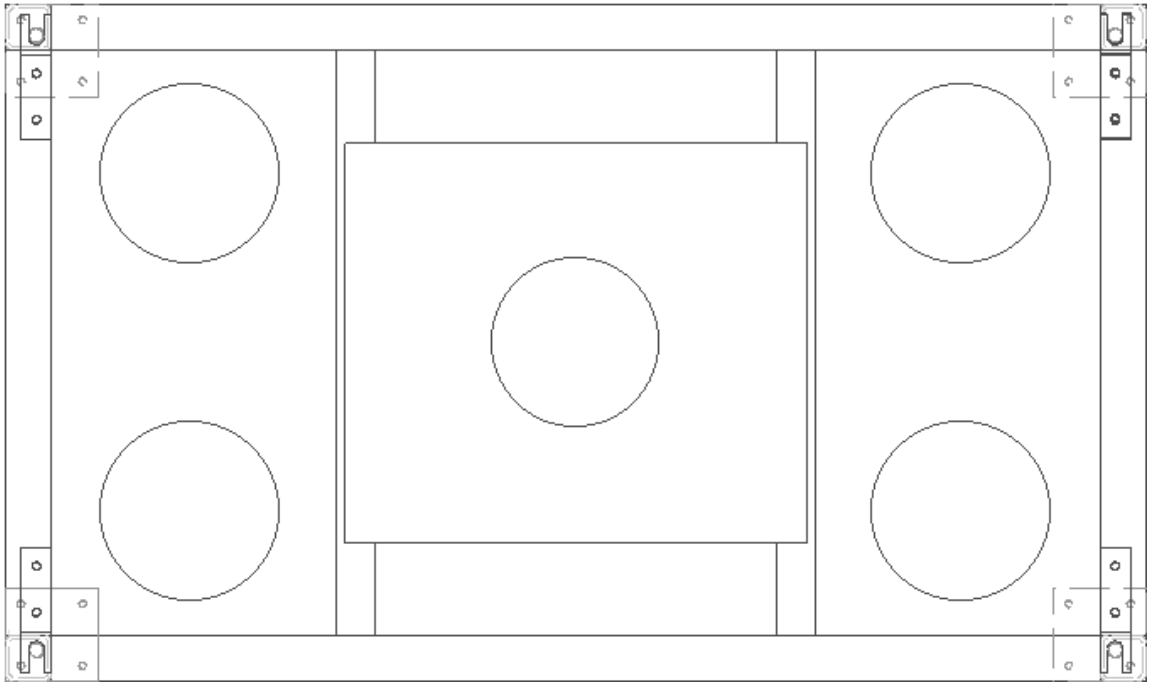


Figure 4-2. Typical View of Seismic Restraints on Main Tool

SpeedFam-IPEC Installation Support

Introduction

The SpeedFam-IPEC Install Team supplies technical support, as required, during the installation of the AvantGaard™ 676. The SpeedFam-IPEC Install Team consists of trained Install Technicians who do qualification procedures. The entire installation and qualification procedure typically takes three weeks.

SpeedFam-IPEC can supply one trained Install Technician for technical support during Customer reliability qualification.

Required Support Equipment

Table 4-6 lists the support equipment required during tool installation and qualification procedures. The table also identifies who is responsible for making sure the equipment is available.

Table 4-6. Required Support Equipment

SpeedFam-IPEC	Customer
Allen wrenches, Bondus -Standard 0.050mm - 3/8”	Forklift
#1 and #2 Straight slot screwdriver	Crowbar
6” Crescent wrench	Air bearing, 6500 lb. (2948 kg) capacity
Digital micrometer	Cleanroom tape
Snap-ring pliers, reversible	Alpha 10 wipes
Diagonal cutters, 6” (15.24 cm)	Stop watch
Needle nose pliers, 6” (15.24 cm)	500 ml Graduated beaker
Wago crimpers	
Wago TB tool	
6” (15.24 cm) Torpedo level	
Straight edge, 6” (15.24 cm)	
Combination wrench set	
Depth micrometer, low profile	
Digital caliper, 6” (15.24 cm)	
Dial indicator	
3 Arm magnetic base	
.036” (0.09144 cm)Drill and bit vise	

Continued on next page

Required Support Equipment, continued

SpeedFam-IPEC	Customer
Exacto knife	
Extraction tool, amp	
Pressure gauge and fittings, Omega	
Edge gap block tool	
Torque screwdriver	
Pliers	
Rubber mallet	
Screwdriver set	
English box wrench set	
Multimeter	
Level	
Wiring tools	
Electrical cabinet key	
1-3/8” Open ended wrench	
Hydraulic jack	
Optical tachometer	
Mitutoyo digital protractor	

Facilities Connection Procedures

DANGER - AN APPROVED FACILITIES DISCONNECT IS REQUIRED BETWEEN THE FACILITY MAINS ELECTRICAL POWER AND THE TOOL. IF AN APPROVED DISCONNECT IS NOT USED, THE FACILITY SIDE OF THE TOOL MAIN DISCONNECT WILL STILL BE CONNECTED TO FACILITY ELECTRICAL POWER EVEN AFTER THE TOOL MAIN DISCONNECT HAS BEEN POSITIONED TO OFF.

Facility Hookup

Facilities Connection procedures consist of hooking up the facilities in preparation for final qualification and production. For safety precautions, do not supply electrical power and start the tool until after a Safety Inspection is done. Do the Safety Inspection in accordance with facility procedures and requirements, or refer to Chapter 3 for tool safety features.

Use the Facilities Connections Checklists on page 4-20, as required, to make sure all connections are correct.

Electrical Ratings

Table 4-7. Electrical Ratings

Component	Rating Location
Electrical Requirements	208 VAC WYE 5 Wire, 50 FLA (60A 65,000 A/C Main Breaker) [S/N 3076, 3078, 3084, 3088] The AIC rating for the main breaker on the tool is 10,000 Amps.
Largest Motor	7.8 FLA
Electrical Drawing Index	4605-728300

Facility Fluids Connections

Introduction Figure 4-3 shows the facility fluids connections on the Main Tool.

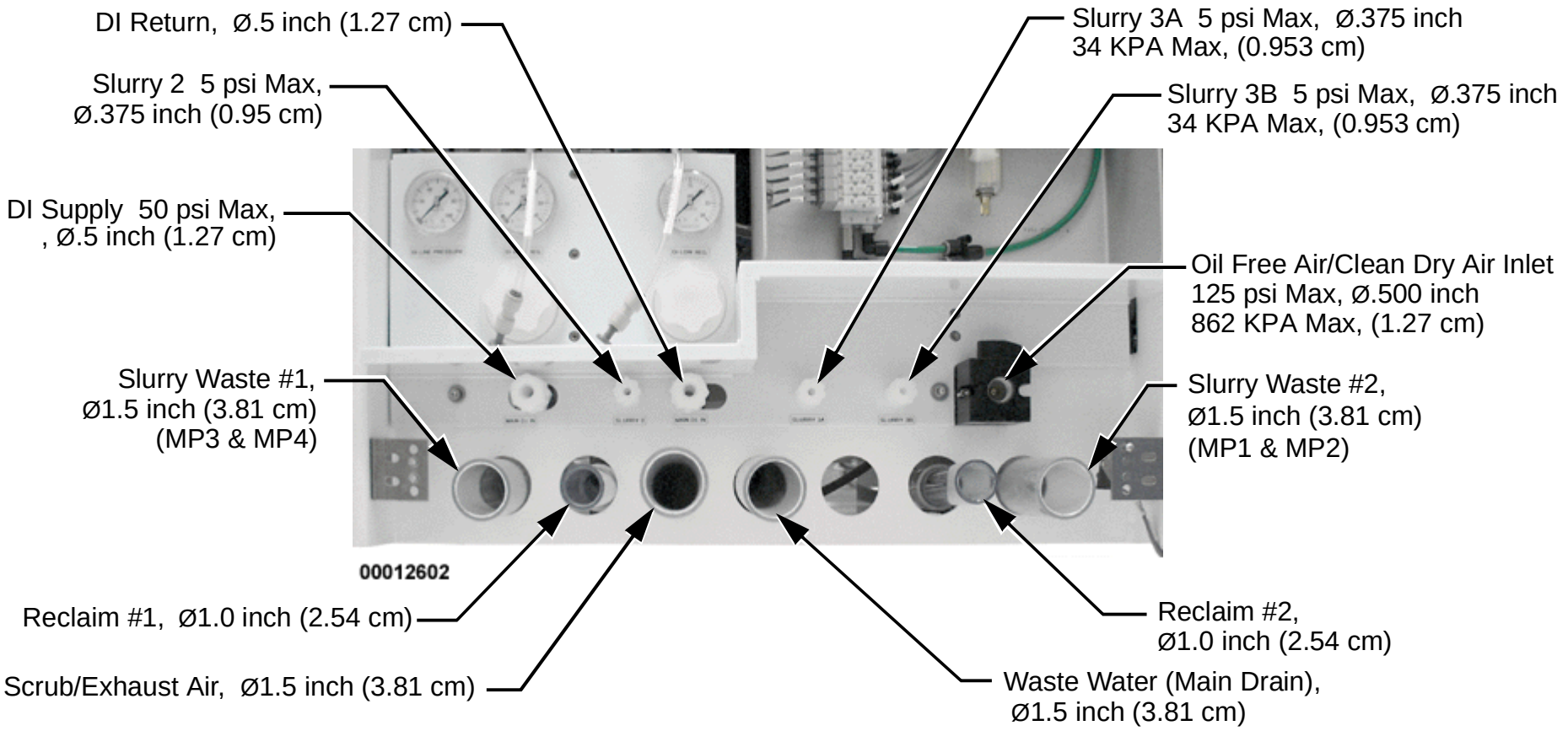

DI Return, Ø.5 inch (1.27 cm)
Slurry 2 5 psi Max, Ø.375 inch (0.95 cm)
DI Supply 50 psi Max, , Ø.5 inch (1.27 cm)
Slurry Waste #1, Ø1.5 inch (3.81 cm) (MP3 & MP4)
Reclaim #1, Ø1.0 inch (2.54 cm)
Scrub/Exhaust Air, Ø1.5 inch (3.81 cm)
Slurry 3A 5 psi Max, Ø.375 inch 34 KPA Max, (0.953 cm)
Slurry 3B 5 psi Max, Ø.375 inch 34 KPA Max, (0.953 cm)
Oil Free Air/Clean Dry Air Inlet 125 psi Max, Ø.500 inch 862 KPA Max, (1.27 cm)
Slurry Waste #2, Ø1.5 inch (3.81 cm) (MP1 & MP2)
Reclaim #2, Ø1.0 inch (2.54 cm)
Waste Water (Main Drain), Ø1.5 inch (3.81 cm)
00012602

Figure 4-3. Typical Main Tool Facility Fluids Connections

Facilities Connections Checklists

Checklists

The following tables are checklists for doing facility connections. The tables are divided into Item/Step, the personnel responsible for doing the procedure, a date completed column, and any reference material required. After each step is completed, the step should be initialled and dated.

- Table 4-8, “Electrical Connections,” on page 4-20
- Table 4-9, “Scrub Lines,” on page 4-21
- Table 4-10, “Fluid and Pneumatic Supply Lines (Left To Right at Back of Main Tool),” on page 4-22
- Table 4-11, “Removing Shipping Restraints,” on page 4-23

Table 4-8. Electrical Connections

ITEMS	SERVICE TECHNICIAN	SERVICE COMPLETED (DATE AND INITIAL)	Reference material
Connect the interconnect cables between Main Tool and Electrical Cabinet	SpeedFam-IPEC		
Power connection: 5 wires in lower center of high voltage cabinet 3 phases, neutral and ground, at #2 gauge copper maximum	Customer contractors		
Photohelic	Customer contractors		
Bonding	SpeedFam-IPEC		

Continued on next page

Facilities Connections Checklists, continued

Table 4-9. Scrub Lines

ITEMS	SERVICE TECHNICIAN	SERVICE COMPLETED (DATE AND INITIAL)	Reference material
Connect the scrub on the lower back of the machine (near the DI H_2O waste) with a 1.5” (3.81 cm) solvent weld elbow	Customer contractors		
Connect the 6” (15.24 cm) SS flange scrub on the bottom of the tool.	Customer contractors		

Continued on next page

Facilities Connections Checklists, continued

Table 4-10. Fluid and Pneumatic Supply Lines (Left To Right at Back of Main Tool)

ITEMS	SERVICE TECHNICIAN	SERVICE COMPLETED (DATE AND INITIAL)	Reference material
Connect DI H_2O supply to the left 0.5” (1.27 cm) furon flare grip bulkhead fitting	Customer contractors		
Connect DI H_2O return to the right 0.5” (1.27 cm) furon flare grip bulkhead (the pressure drop to the DI H_2O return lines must be made external to the Main Tool.)	Customer contractors		
Plug the third connection (0.375” (0.9525 cm) quick connect)	Customer contractors		
Connect the black watts shut off / lock off (0.5” fnpt (1.27 cm)) to Oil Free Air (OFA)	Customer contractors		

Continued on next page

Facilities Connections Checklists, continued

Table 4-11. Removing Shipping Restraints

ITEMS	SERVICE TECHNICIAN	SERVICE COMPLETED (DATE AND INITIAL)	Reference material
Remove ties and wrapping from Robot	SpeedFam-IPEC		
Remove ties and wrapping from Wafer Combs	SpeedFam-IPEC		
Remove ties and wrapping from cassette lift	SpeedFam-IPEC		
Remove Ties from Pad Conditioner	SpeedFam-IPEC		

Notes:

Chapter 5

Setup and Fingerprint

Contents This chapter contains the following topics:

Topic	See Page
Setup and Fingerprint	5-2
Installation Check Procedure	5-3
Fingerprint Equipment List	5-6
Tool Fingerprint Checklist	5-7

Setup and Fingerprint

Introduction

This chapter contains the Installation Check Procedure and a Tool Fingerprint Checklist to make sure the tool is operating correctly with the baseline settings (fingerprint specs) that were written down before the tool was shipped and installed. The fingerprinting process should take approximately one week to complete.

NOTE: **All fingerprint procedures are also given in the AvantGaard™ 676 Maintenance Manual.**

Fingerprint Tasks

The identified owner is responsible for the following tasks.

Owner	Task
SpeedFam-IPEC	Check and set all calibrations on tool according to the previous fingerprint specs.
SpeedFam-IPEC	Review tool for leaks, loose wires, etc. (“Installation Check Procedure” on page 5-3)
SpeedFam-IPEC	Make sure any problems identified during the installation process are resolved to the satisfaction of the customer.
Customer	Make sure all facility connections are correctly hooked up and provide adequate resources to the tool.
Customer	Make sure test wafers are available.
Customer	Make sure fingerprint checklist is completed. (“Tool Fingerprint Checklist” on page 5-7)

Installation Check Procedure

CAUTION - USE CAUTION WHEN CHECKING THE FOLLOWING COMPONENTS AND SYSTEMS. YOU WILL BE EXPOSED TO VARIOUS HAZARDS WHEN CHECKING COMPONENTS AND ASSEMBLIES IN THE FOLLOWING PROCEDURE. DO THIS PROCEDURE ONLY AFTER THE TOOL AND INSTALLATION HAVE PASSED ALL APPROPRIATE CUSTOMER SAFETY INSPECTIONS.

Introduction SpeedFam-IPEC personnel and a customer representative must do a check of the items listed in Table 5-1 to make sure all installation procedures have been completed correctly.

Table 5-1. Installation Check Procedure

Items					Initial
Make sure OFA and DI are ON and the Chemical Disposal System KD100 (CDS) is enabled.					
Do the normal start procedure to power-up the tool. (Make sure the light on the Main Power Panel Assembly comes on to show the panel interlock circuit is enabled.)					
Make sure the following components and systems are ON and operating correctly. • Monitors (2 locations) • Keyboard • Mouse • Control Station Light Pen, Operator station • Control Station Light Pen, Electrical Cabinet					
	MP1	**MP2**	**MP3**	**MP4**	**C2C**
Make sure the following voltages are present: • 24 Volts • 12 Volts • -12 VDC • 5 Volts					

Continued on next page

Installation Check Procedure, continued

Items	MP1	MP2	MP3	MP4	C2C
Check for any leakage:					
• Air					
• DI					
• Drain					
Run Slurry Pump 1 and Slurry Pump 2 on each head, check for leaks, then calibrate.					
• Slurry Pump 1					
• Slurry Pump 2					
Initialize C2C:					
• Robot					
• Pad Conditioner 1					
• Pad Conditioner 2					
Initialize each MP					
Check each of the following critical points to make sure the robot Tool Points are correctly set. • Spray box • 4 load points • 4 unload points • Wafers 1, 25, 26, 50.					
Run Confidence Wafers					
Do fingerprint procedures (See “Tool Fingerprint Checklist” on page 5-7.)					

Continued on next page

Installation Check Procedure, continued

Items	MP1	MP2	MP3	MP4	C2C
Change DF200, Wafer Carrier Ring, and Pad on all 4 MP's.					
Do Pad Break-in					
Do a Reliability run of 100 wafers					
Do fingerprint procedures (See "Tool Fingerprint Checklist" on page 5-7.)					
Run 48 wafers without interruption					

Fingerprint Equipment List

Introduction

Table 5-2 identifies the tools that SpeedFam-IPEC will supply for doing the tool fingerprint. The Tool Fingerprint Checklist on page 5-7 specifies the actual fingerprint calibrations and parameters for the tool.

Table 5-2. SpeedFam-IPEC Supplied Tools

Tool List
Omega gauge
Dial indicator with magnetic base
Parallel edge gap tool
Voltmeter
Stopwatch
Digital level
Allen wrench set

Tool Fingerprint Checklist

Date of Completion: _____ S/N: _____

Engineering Approval: _____

Introduction

Write down the settings for the following parameters. Adjust, as necessary, until the settings are in limits.

Table 5-3. Tool Fingerprint Checklist

OFA Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C
OFA Mains Pressure	Facilities	120 psig (827 KPA gauge)					
Pneumatic Systems Regulation	MP Lower Panel Assemblies	90 ± 5 psi (621 ± 34 KPA)					
	C2C Lower Panel Assemblies	90 ± 5 psi (621 ± 34 KPA)					

Pressure Regulators

MP Low Pressure Regulators	MP Lower Panel Assemblies	25 ± 2 psi (172 ± 14 KPA)					
	MP Upper Panel Assemblies	25 ± 2 psi (172 ± 14 KPA)					

NOTE: **Write down the actual setting of the low pressure regulators. Do not change the set point if setting are in limits.**

Continued on next page

Tool Fingerprint Checklist, continued

OFA Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C
MP pad air regulators (Measurement 1)	MP main OFA enabled. (Static measurement with pad air plumbed directly into meter)	8 - 10 psig closed (55 - 69 KPA closed)					
MP pad air regulators (Measurement 2)	MP main OFA enabled. (Pass through measurement with meter Tee'd into pad air line)	1-2 psi open (6.9 - 13.8 KPA open)					
Polish pressure static calibration	MP main air on wafer installed in head head down polish air on	3.00 ± .02 psig (20.7 ± 0.138 KPA)					

Continued on next page

Tool Fingerprint Checklist, continued

OFA Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C
Wafer pressure static calibration	MP main air on Connect reference Gauge to wafer air (orange line) Wafer installed in head Head down Wafer vac off Wafer vac enable off Wafer air on Polish air on at equal value	3.00 ± .02 psig (20.7 ± 0.138 KPA)					
	Software set delta p	-0.05 to -0.15					

DI Water Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C
Water Pressure Regulators	DI H_2O High 30-40 psi	30 psi (207 KPA) at high flow					
	DI H_2O Low 10-20 psi	10 psi (69 KPA) with flow					
Bypass Rate Cassette 1 and 2	Flow through all wet cassette holes	1 in/min (2.54 cm/min) 8-10 minutes fill time					

Continued on next page

Tool Fingerprint Checklist, continued

Slurry Parameters

Slurry Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4
Pump Calibration	Slurry 1	200 ± 5 ml/min				
	Slurry 2	200 ± 5 ml/min				
	Slurry 3A	200 ± 5 ml/min				
	Slurry 3B	200 ± 5 ml/min				

Continued on next page

Tool Fingerprint Checklist, continued

Electrical Specification

Electrical Specification	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C	EP
Bus Voltages	Measure each voltage at each Low Voltage panel in the electrical cabinet							
	5V	5.25V ± .25						
	12V	12V ± 0.25						
	-12V	-12V ± 0.25						
	24V	24V ± 0.25						
Motor Rotation	Polish Head	280 ± 10 rpm						
	Wafer Head	16 ± 2 rpm						
Make sure all heads rotate clockwise. (Look up at Wafer Head, and down at Polish Head to view rotation direction.)		CW						

Continued on next page

Tool Fingerprint Checklist, continued

Mechanical Parameters

Mechanical Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4
Tool Level	Side to Side on robot plate	±0.1 degrees				
	Front to Back on robot plate	±0.1 degrees				
	Side to Side on edge gap ring	±0.1 degrees				
	Front to Back on edge gap ring	±0.1 degrees				
Wafer Head	Vertical wobble measured near OD of wafer head @ 280 rpm and 3 psi (20.7 KPA)	0.010” (0.0254 cm) TIR				
	Axial runout of wear ring	0.010” (0.0254 cm) TIR				
	Wafer Recess (measure at 8 places)	0.010” - 0.026” (0.0254 - 0.0645 cm)				
Polish Head	Axial runout	0.005” (0.0127 cm) TIR				

Continued on next page

Tool Fingerprint Checklist, continued

Mechanical Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4
Edge Gap Calibration	Measure at 3 places under each jacking tower	0.765” ± .005” (1.943 - 0.0127 cm) w/ Parallels and gap ring.				
Make sure Tool Points are in limits						
Pad Conditioner	Downforce	Write down actual				

Continued on next page

Tool Fingerprint Checklist, continued

Leak Test Parameters

Leak Test Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4	C2C
Wafer Head	head down w/ wafer @ 3 psi (20.6 KPA) on wafer and polish head	< 0.30 psi (< 2.07 KPA) in 30 sec.					
Polish Head	head down w/ wafer @ 3 psi (20.6 KPA) on wafer and polish head	< 0.03 psi (< 2.07 KPA) in 30 sec.					
Robot wand	front w/wafer	8 - 14.7 psi (55 - 101 KPA)					
	front w/o wafer	0 ± 0.6 psi (0 ± 4.1 KPA)					
	rear w/ wafer	8 - 14.7 psi (55 - 101 KPA)					
	rear w/o wafer	0 ± 0.6 psi (0 ± 4 KPA)					

Continued on next page

Tool Fingerprint Checklist, continued

Spray Pattern Parameters

Spray Pattern Parameter	Datum Value or Function	Set Point	Spray 1	Spray 2
Spray Box	visual pattern	full coverage plus proper jet angles		
Pad Conditioner Rinse	visual pattern	full coverage		

Spray Pattern Parameter	Datum Value or Function	Set Point	MP1	MP2	MP3	MP4
Pad Rinse	visual pattern with no pad	> 2” (> 5 cm) squirt on all 20 holes of lower V-band clamp ring				

Continued on next page

Tool Fingerprint Checklist, continued

Software

Software / Hardware Configuration	Datum Value or Function	Location	File Name
SysCon	System controller - p90	v22sys	syscon.exe v3.0
MPx	Planarizer - mc brick 486dx4100	v22mpl	ong221v.exe v3.0
C2C	C2C/robot - mc brick 486dx4100	v22c2c	ong221v.exe v3.0
Endpoint	Endpoint det - mc brick 486dx4100	n/a	n/a
OS	Windows for Workgroups v3.11	global	win.com v3.11
Network	Thinnet netbios/netbeui	global	n/a
Software version			3.0

Chapter 6

Qualification

Contents This chapter contains the following topics:

Topic	See Page
Qualification	6-2
Qualification Requirements	6-3
Process Performance	6-4
Customer Qualification	6-5

Qualification

Introduction

After the tool has been installed, calibrated, and the SpeedFam-IPEC Install Team has made sure the Fingerprint values are in limits, it is ready to be qualified.

NOTE: **A signed copy of the fingerprint checklist should be on file with the system notebook and reviewed by the qualifier before starting qualification procedures.**

Purpose

The purpose of qualification is to make sure the tool has been correctly installed, calibrated, and tested. Tool qualification will confirm that the products processed through the tool meet the product specifications.

Qualification of the tool by SpeedFam-IPEC Install Technicians is the last step before it is turned over to the Customer. Qualification is to be tested using test wafers supplied by Customer.

Qualification Requirements

Table 6-1. Source Inspection Criteria Summary

	Minimum Requirement
Process Acceptance Criteria • WIW Uniformity (3σ, 3mm) • Removal Rate • Pad Life	 15% 2100 Å/min 125 min
Equipment Acceptance Criteria • TPT • MWBI	 30 wph 500 wafers

Process Performance

Overview

Process performance is based on 650nm 6% 3σ blank tungsten test wafers.

- 8 cassettes (200 wafers) should be run with the recipe in 1.6 (see page 2-6) on all 4 heads.
- WIW uniformity (3σ (sigma), 5mm edge exclusion): <15%
- Removal rate > 2100 Å
- Pad life > 125 min. (Pad life is defined as the number of consecutive minutes run on the pad which meet removal rate and uniformity criteria, per the specification.)

Conditions

The following conditions must be met during the test:

- All covers up and all doors closed on the tool.
- Only the front (bay side) monitor may be used for control of the machine.
- If the test is not run continuously (e.g., 16-hour days instead of 24-hour days), the machine will be left on during the idle period.

Customer Qualification

The checklist in Table 6-2 gives a typical qualification done by the customer. Use as reference only.

Table 6-2. Customer Qualification

Items	MP1	MP2	MP3	MP4
Batch #1: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Test Plug Recess and Dishing Wafers				
Batch #2: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Batch #3: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Batch #4: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Test Plug Recess and Dishing Wafers				
Replace pads with new.				
Pad Pre-Conditioning with slurry - 10 sweeps on each pad				
Pad break-in.				

Continued on next page

Customer Qualification, continued

Items	MP1	MP2	MP3	MP4
1 Wafer per head for 5 min				
Batch #5: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Batch #6: 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Batch #7: : 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				
Test Plug Recess and Dishing Wafers				
Batch #8: : 24 (9000 Angstroms W - wafers) polished for 5 min followed by 4 process monitor wafers polished for 1 min, and 4 surfscan wafers.				

Chapter 7

Troubleshooting and Diagnostics

Contents This chapter contains the following topics:

Topic	See Page
Introduction	7-2
Troubleshooting Tables	7-3

Introduction

Overview

Use the following troubleshooting and diagnostic procedures to quickly discover and resolve problems with the tool so down time can be minimized. Using these troubleshooting procedures can resolve tool problems quickly without having to call for internal or external additional assistance.

Process

Do all troubleshooting using a logical, system approach, by the process of elimination, and by following written procedural steps. Making adjustments during any troubleshooting procedure should be considered a final option.

Modular Systems

The systems in the tool are modular. This means that some systems can continue to function while others are stopped. The modular design also allows quick and easy component replacements. Many components and assemblies, including the electrical panels and pneumatic panels, can be quickly replaced with new units while repair work on failed components is done off site.

This chapter gives some basic strategies and procedures for troubleshooting and doing diagnostic work on the tool. Procedures for recovering from system faults are discussed, and a basic troubleshooting reference table is introduced as a guide to solve problems on the tool.

Troubleshooting Tables

Introduction

The following tables represents a basic troubleshooting guide for the tool. Information is grouped by system for easy reference. If there is still a problem after doing the response shown, it may be necessary to contact a SpeedFam-IPEC service representative.

- Table 7-1, “System Troubleshooting Table,” on page 7-3
- Table 7-2, “User Interface Troubleshooting Table,” on page 7-4
- Table 7-3, “MP Troubleshooting Table,” on page 7-5
- Table 7-4, “Wet Cassette Troubleshooting Table,” on page 7-7
- Table 7-5, “Robot Troubleshooting Table,” on page 7-8

Table 7-1. System Troubleshooting Table

Symptom	Response
Machine does not come on	Make sure all covers are in place and that the EMO reset button has been pushed.
Light pen fails to respond to operator	Make sure control of the pen has been switched to the correct monitor station. If not, switch it, then retry.
Erratic cursor movement	• Re-calibrate through Windows • Clean Light Pen lens • Clean operator control station monitor cover

Continued on next page

Troubleshooting Tables, continued

Table 7-2. User Interface Troubleshooting Table

Symptom	Response
Bay / Chase side monitor is dark	• Check power light on SysCon controller. If it is not glowing red, make sure the power switch is set to 1, then check it again. • Make sure that the green light on bay/chase side monitor is ON. If not, call maintenance.
Light pen does not work on bay side monitor	Make sure the light pen select box in the Electrical Cabinet is set for bay side. If not, set it to bay side.
Light pen does not work on chase side monitor	Make sure the light pen select box in the Electrical Cabinet is set for chase side. If not, set it to chase side.
Light pen cursor moves by itself	Check to see if someone is running the tool from the other control station.
System will not allow you to log in	Talk to your Supervisor. The passwords may have been changed.
System won't boot up	If the SysCon screen is not displayed on the operator side control station or the monitor in the Electrical Cabinet, call maintenance personnel.
Keyboard won't respond	Make sure the keyboard/ video switch box is switched to the correct monitor station. If not, switch it and retry.
System won't enter into Manual Mode	• Check to see if the MP is in run mode. If it is, wait for it to finish then try again. (Manual Mode is only available if the tool is in an idle condition.) • Have you logged in yet? If not, log in then try again.

Continued on next page

Troubleshooting Tables, continued

Table 7-3. MP Troubleshooting Table

Symptom	Response
MP heads won't come on	Check all electrical and mechanical interlocks. Make sure they are closed and latched.
MP cylinder head will not fully close	Stop the system and open the side cover. Make sure nothing has fallen into the polish area and that the slurry shield is not tilted. (Software has been changed. If the shield is tilted, the MP will not work.)
Slurry/ Water does not enter the wafer polishing head	• Make sure the pump hoses have not broken or become clogged. Check for blockages or holes. Replace hose if required. • Keep all pumps turning while checking for slurry or DI water. • If the pump and hoses seem OK, check the polish pad to see if the pad holes are all clear, especially if the pad has been recently replaced. This is most easily checked by starting DI water in Manual Mode, then pressing lightly on the polish pad with gloved hands. The water should push up through the entire hole pattern. If not, remove the pad and clear the holes. • The DI water or slurry filters may be clogged. Check the incoming filter located at the rear lower center of the tool. If a filter is clogged, replace it before running. Refer to the Maintenance Manual for detailed procedures.

Continued on next page

Troubleshooting Tables, continued

Symptom	Response
Clicking noises can be heard during the wafer polish cycle	**Stop the process immediately!** A clicking noise coming from the polish head usually is a process problem involving poor slurry flow or a mechanical problem with the head or polishing mechanics.
Squealing noises	**Stop the process immediately!** Squealing of the pad against the wafer is usually an indication that slurry is not flowing through the polish pad and the wafer is being run dry. Failure to correct this problem can result in a damaged wafer. Refer to the responses given above for “Slurry/ Water does not enter the wafer polishing head”.
Wafer will not load into the wafer carrier head	• Check the position of the wafer relative to the wear ring during loading. • Check for excessive wafer recess, irregularities or buildup on the DF200 pad, or degraded vacuum to the wafer carrier head.

Continued on next page

Troubleshooting Tables, continued

Table 7-4. Wet Cassette Troubleshooting Table

Symptom	Response
Water overflows the outer drain of the wet cassette	• Inspect the three basin drain holes and clean them of any debris. • If the drain is clear, remove the lower panel and check to see the main drain line is also clear and fully on. Remove any debris that may have accumulated.
Robot cannot pick wafers out of the cassette	• Make sure the cassette is correctly and firmly located on the alignment comb, then try again. • Check vacuum reading. • Remove the cassette and check for debris on the manifold plate and the alignment comb.
No water is flowing through the cassette	Make sure the water source to the machine is on and that the bleed fill for the cassettes is set properly.

Continued on next page

Troubleshooting Tables, continued

Table 7-5. Robot Troubleshooting Table

Symptom	Response
Robot fails to pick wafer out of cassette	• If the arm is physically picking from the wrong position, the pick-up arm may be bent or damaged. Call a Tier 3 technician to replace any damaged components. • Check the tape on the robot wand. Replace any tape that is peeling, marred, or worn. • The robot may have lost communication with the Genmark controller. Correct the situation by shutting down and restarting the tool. • The robot may have lost feedback by running into something or receiving a shock load. Feedback can be restored by going into the robot manual mode and homing the robot. Feedback can also be restored by shutting off the unit, then restarting.

Appendix A

Glossary, Acronyms, and Abbreviations

Contents

This chapter contains the following topics:

Topic	See Page
Glossary	A-2
Acronyms and Abbreviations	A-9

Glossary

Table A-1. Glossary

Item	Description
Boat	See: Wafer Cassette
Brush Arm Assembly	An assembly in the Pad Conditioning System containing the pad brush, DI water lines, and ports.
Bus Bar	Power distribution bar in the back of the Electrical Cabinet that supplies electrical power to several wiring systems in the Tool.
C2C	Cassette to Cassette
C2C High Voltage Panel	High voltage panel in the Electrical Cabinet that contains and powers the controller for the Genmark or optional Hine robot.
C2C Low Voltage Panel	Low voltage panel in the Electrical Cabinet that contains the C2C computer and logic control components for all C2C systems.
C2C Lower Pneumatic Panel	Major functions include controlling the wet cassette lift towers for lifting and turning the wafer boats, the DI Water fill and drain processes of the wet cassette, the on/off cycles of the spray box, and a spill sensor that detects system spills during operation.
C2C Upper Pneumatic Panel	Pneumatic supply and control for C2C components on the upper half of the Tool, specifically, for the wafer sensor array, the robot system, and for the sliding operator access door.
C2C System	All Tool systems and stations associated with wafer storage, sensing, rinsing, and movement.
Carrier Backing Plate	Stainless steel plate used as the mounting surface for the DF-200 wafer backing pad.

Continued on next page

Glossary, continued

Item	Description
Carrier Wear Ring	A hard plastic ring located on the bottom of the wafer head. It contacts the polish head and keeps the wafer in position during polishing.
Carrier Lift Tower	Holds the wafer cassettes in the Wet Cassette Assembly. Positions the wafer cassettes during the loading and unloading process.
Chase Side	The rear side of the Tool, closest to the Electrical Cabinet, usually located in the service chase area.
Control Station	One of two control stations used to operate the Tool. The primary Control Station is located on the right front side of the Tool. A second Control Station is located directly below the SysCon computer in the middle section of the Electrical Cabinet. This station is used primarily for diagnostic or maintenance work.
Diaphragm	Neoprene rubber gasket used on the wafer and polish heads.
DI Water	De ionized water
Diverter Valve	Electronically controlled flow device for DI water.
Dual Wet Cassette Basin	A dual cassette basin that can hold two wafer cassettes during processing.
Edge Gap	Critical and specified gap between wafer head and polish head.
Electrical/Control System	The Electrical Cabinet and all associated computers and logic control systems.
Emergency Off	Emergency system that disengages main electrical power and air from the Tool and stops the planarizer heads.
Fluids System	The Tool plumbing system which includes Slurry System, DI Water, and air supply, distribution and drainage.

Continued on next page

Glossary, continued

Item	Description
Head Assembly	All the components in a wafer head or polish head.
Interconnect Boxes	Electrical boxes containing the wiring connections and links from the Electrical Cabinet to the Tool.
Interlock	A safety feature which immediately stops polishing operations if activated, but does not shut off main power.
Leak Detection System	Warning system connected to sensors located in the lower catch pan and slurry modules. A system alarm will also sound if activated by leaking fluids.
Lockout / Tagout	A site specific set of procedures detailing the methods used to disable Tool electrical power and to notify other personnel. These procedures are designed to make the Tool safe and reduce risk of injury during maintenance procedures. An example Lockout / Tagout Procedure given in Chapter 3.
MP Lower Pneumatic Panel	Functions include supply and regulation of main air for the planarizer module, air filtration, control of polish pad air pressure settings, air for wafer transfer, slurry recycling control, and lower head park position sensors
Main Power Distribution Panel	Located in the Electrical Cabinet, contains the AC and DC power conversion and distribution components which supply power to all Tool systems. Tool main power input and conversion takes place in the main power panel.
Manual Mode	Allows specific systems to be operated manually. Used during maintenance and diagnostic procedures.
Operator Side	The front or “operator” side of the Tool, located in the operator bay.

Continued on next page

Glossary, continued

Item	Description
Planarizer Computer	A 486 microcomputer which controls a specific planarizer head station. Located on a low voltage Planarizer panel in the Electrical Cabinet, there is an Planarizer computer for each MP module.
Planarizer High Voltage Panels	Controls wafer and polish head motor revolution speed as well as pump speeds in each slurry module.
Planarizer Low Voltage Panels	Contains logic control hardware for each planarizer sub-system.
Planarizer Lower Pneumatics Panels	Pneumatic supply and control for system operations in the lower half of the Tool. The function of the lower pneumatic panel is to supply and regulate polish pad pressure during polish cycles.
Planarizer Upper Pneumatics Panels	Pneumatic supply and control for system operations in the upper half of the Tool. Primary functions include raising, lowering, and parking the wafer head during each polishing cycle, and control of the wafer pressure from the head itself.
NSK Controller	Controller systems for the pad conditioners.
Operator Control Station	Located on bay side of Tool, includes a monitor with a light pen.
P/I Transducer	Monitors wafer head and polish head air pressure actually flowing to the head.
Pad Conditioners	Designed to clean and condition the polish pads after each polish cycle.
Pad Conditioners High Voltage Panels	Panels that house and power the controllers (the pad conditioner controllers).

Continued on next page

Glossary, continued

Item	Description
Pad Conditioning System	All components of the pad conditioner including the servo motor, arm, brush and controller. Used to “rough up” or revitalize the polish pad.
Paddle (Wand)	See: Wand
Panel Reset	A reset button on the Electrical Cabinet which allows air and voltage to be reapplied to machine after an interlock violation.
Piab Trap	An air filter on pneumatic panels which protects the pressure sensor from slurry or DI water contamination.
Pinch Point	An area of the Tool or Electrical Cabinet which has been identified as being capable of pinching and causing injury.
Planarizer Module	Components directly involved with the wafer polishing process, including planarizer head assemblies, and MP upper and lower pneumatic panels.
Polish Basin Drain Screens	A mesh screen covering polish basin drains.
Polish Bell	A housing part which belongs to the polish head assembly.
Polish Head	The lower head which supplies the polishing action on the wafer while it is held in place by the upper head.
Polish Head Diaphragm	Neoprene rubber gasket for the polish head (also known as polish bladder)
Polish Pad	The pad which serves as the contact surface during wafer polishing.
Polish Recipe	A set of process variables used by the SysCon computer defining the specify polish procedures for a batch of wafers.

Continued on next page

Glossary, continued

Item	Description
Process Hazards	Hazards which may be a physical danger for operators or maintenance personnel during operation and service of the Tool or Electrical Cabinet.
Retaining Ring	Part of the upper head assembly which anchors the backing plate to the upper portion of the head.
Robot	The Genmark Gencobot (or optional Hine) multi-axis robot loads, unloads, and moves the wafers.
Scrub Exhaust	Two scrub exhaust systems evacuate exhaust air used by the pneumatic devices and heat exhaust from the Electrical Cabinet.
Scrub Line	Air lines used by the scrub exhaust system.
Service Mode	A mode of operation for the Tool that allows authorized Maintenance personel to do various high level Maintenance tasks.
Servo Motor	Pad Conditioner motor body.
Slurry	A generic, silica based chemical abrasion compound used during the wafer polishing process.
Slurry Mesh	A circular mesh pad located under polish pad. It helps distribute slurry evenly across the under side of the polish pad.
Slurry Particulate	Slurry residue and process matter accumulated on wafers and Tool surfaces as a result of the polishing process.
Slurry Shield Sensors	Sensors which signal when the slurry shields around the polish heads are raised or lowered during a polishing cycle.
Spray Box Assembly	A rinsing station used for rinsing and cleaning wafers after polishing.

Continued on next page

Glossary, continued

Item	Description
System	A collection of components or assemblies in the Tool designed to do a specific function.
SysCon Computer	A Pentium® 100 Mhz computer used as the Tool network server and main control computer. Contains all system software.
System Initialization	Start-up and initialization process involving most components.
Wafer Cassette	A removable molded container used to hold wafers in the Wet Cassette Assembly basin. Cassettes can be loaded with up to 25 wafers.
Wafer Head	Same as the Wafer Carrier Head. It places and holds wafers in contact with the polish head during the polish process.
Wafer Head Diaphragm	Neoprene rubber gasket used in the wafer head to supply pressure on the wafer.
Wafer Sensor Array	Sensing mechanism that senses the number and position of wafers loaded into a “boat” or wafer cassette.
Wand (Paddle)	The end effector on the robot arm. The wand is the wafer contact surface for all wafer handling procedures.
Wave Generator	Located under polish bell, the mechanical component that supplies wave movements of the polish heads.
Wet Cassette	See: Wafer Cassette

Acronyms and Abbreviations

Table A-2. Acronyms and Abbreviations

Abbreviation or Acronym	Definition
A/min	Angstroms Per Minute
AC	Alternating Current
AI	Analog Input
AIC	Amp Interrupting Current
Amps	Amperage
AO	Analog Output
AWG	American Wire Gauge
APM	Advanced Pad Motion Option
BHCS	Button Head Cap Screw
BLK	Black
BLU	Blue
BRN	Brown
C	Celsius
C2C	Cassette to Cassette
CCW	Counter Clockwise
CDA	Clean Dry Air
CH or CHAN	Channel
CM	Centimeters

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
CMP	Chemical Mechanical Planarization
COM	Common
CW	Clockwise
DC	Direct Current
DI	Digital Input
DI Water	Deionized Water
DO	Digital Output
DV	Delta Valve
E/P	Voltage to Pressure
EHS	Environmental Health and Safety
EMO	Emergency Machine Off
EP	Endpoint
EPA	Environmental Protection Agency
F	Fahrenheit
FHCS	Flat Head Cap Screw
F76	Filmetrics® (F76) Endpoint Detection system
GPH	Gallons Per Hour
GPM	Gallons Per Minute

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
GRD	Ground
H_2O	Water
HV	High Voltage
Hz	Hertz
I/O	Input/Output
I/P	Current to Pressure
ID	Inner Diameter
IEC	International Electrotechnical Commission
ILD	InterLayer Dielectric
IPA	Isopropyl Alcohol
ISO	International Standards Organization
KPA	Kilopascals
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LPM	Liters Per Minute
LV	Low Voltage
mA	milliAmps

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
MC	Motor Controller
mhZ	MegaHertz
MIN	Minute
mL	Milliliters
mm	Millimeters
MOV	Metal Oxide Varistors
MP or MPL or MPx or MP?	Microplanarizers
MSDS	Material Safety Data Sheet
N/A	Not Applicable
N_2	Nitrogen
NEC	National Electrical Code
NEG	Negative
NEMA	National Electrical Manufacturer Association
NEU	Neutral
NFPA	National Fire Protection Agency
NPT	National Pipe Thread
NVx	Pneumatic Valve x

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
OD	Outer Diameter
OEM	Original Equipment Manufacture
OS	Operating System
OSHA	Occupational Safety and Health Agency
P/N	Part Number
PC1 or Pad1	Pad Conditioner 1
PC2 or Pad2	Pad Conditioner 2
PE	Protective Earth
PH	Phase
pH	Acid/Base Balance
PIK	Product Improvement Kit
PM	Preventive Maintenance
POS	Positive
PPE	Personal Protective Equipment
PSI	Pounds Per Square Inch
PSID	Pounds Per Square Inch Differential
PSIG	Pounds Per Square Inch, Gauge
PVC	Poly Vinyl Chloride
RCP	Recipe

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
REV	Revision
RF	Radio Frequency
RFK	Retro-Fit Kit
RLY	Relay
RPM	Revolutions per Minute
Rx	Receive
S2-93	Safety Guidelines for Semi-conductor Manufacturing Equipment
SCFM	Counter Clockwise
sec	Seconds
SECS/GEM	Semi Equipment Communication Standard
SEMI	Semiconductor Equipment and Materials International, Inc.
SHCS	Socket Head Cap Screw
SMA Connector	Subminature-A coaxial feedthrough
SpeedFam-IPEC	SpeedFam Integrated Process Equipment Corporation
SOLx	Solenoid x
SS/SST	Stainless Steel
SysCon	System Controller Computer

Continued on next page

Acronyms and Abbreviations, continued

Abbreviation or Acronym	Definition
TiN	Titanium Nitride
TPT	Throughput
Tx	Transmit
UCL	Upper Control Limit
UL	United Laboratories
V	Volts
VAC	Volt AC
VDC	Volt DC
W	Tungsten
WHS	Wafer Handling System
WIP	Wafers in Process
wph	Wafers per Hour
XCON	Cross-Connect

Notes:

Appendix B

I/O Tables

Contents

This chapter contains the following topics:

Topic	See Page
Introduction	B-2
C2C Discrete I/O	B-3
C2C Analog I/O	B-31
MP Discrete I/O	B-32
MP Analog I/O	B-41

Introduction

Overview

Listed on the following pages are the C2C Discrete and Analog I/Os and the MP Discrete and Analog I/Os. These tables will aid you in exploring and understanding the I/Os and how and when to use them. Please refer to the following legend while using the tables.

Table B-1. I/O Definitions

Symbol	Definition
C	C2C
V(9)	Value (#) Solenoid
B	Bottom/Lower
T	Top/Upper
M	MP
FC#	Flow Control Valve‘
PCV#	Pilot Check Valve
C/VS#	C2C/Vacuum Sensor
P/V#B	Pad Conditioner/Valve

NOTE:

Example: C/V9 B refers to C2C, valve # 9 bottom.

C2C Discrete I/O

Table B-2. C2C Discrete I/O

Chan	Type	Logic	Initial	Name	Description
0	INPUT	POS	OFF	DIESTOP	Emergency Off - When line voltage is dropped by pushing an EMO button, this input will be toggled to a POS input. 110V will still be present to the EMO transformer, and 24V in the EMO circuit.
1	INPUT	POS	ON	DILEAK_ DETECTED	Leak Detection - Signal high pulled low at detection.
2	INPUT	POS	OFF	DICASSETTE_1 _UP	Cassette 1 is at the UP position. Cylinder ”Raise Cassette 1” for cassette 1 is fully extended and sensor HES-1 is activated.
3	INPUT	POS	ON	DICASSETTE_1 _DOWN	Cassette 1 is at the DOWN position. Cylinder “Raise Cassette 1” for cassette 1 is fully contracted and sensor HES-2 is activated.
4	INPUT	POS	OFF	DICASSETTE_1 _IN_PLACE	Wafer cassette is in position for cassette 1 and is sensed by optical sensor PHOTO-1 “Cassette 1 In Place”.
5	INPUT	POS	OFF	DICASSETTE_1 _LOAD	Cassette 1 is rotated to align with the front of the machine casting and is ready to accept or remove wafer cassettes. Cylinder “Rotate Cassette 1” is fully extended. Position is detected by sensor HES-3.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
6	INPUT	POS	ON	DICASSETTE_1 _OPERATION	Cassette 1 is aligned to the Wet Cassette tub. This is the standard position for lowering the cassettes into the tubs and for picking and returning wafers during production. Cylinder “Rotate Cassette 1” is fully contracted. Position is detected by sensor HES-4.
7	INPUT	POS	OFF	DICASSETTE_2 _UP	Cassette 2 is at the UP position. Cylinder “Raise Cassette 2” for cassette 2 is fully extended and sensor HES-5 is activated.
8	INPUT	POS	ON	DICASSETTE_2 _DOWN	Cassette 2 is at the DOWN position. Cylinder “Raise Cassette 2” for cassette 2 is fully contracted and sensor HES-6 is activated.
9	INPUT	POS	OFF	DICASSETTE_2 _IN_PLACE	Wafer cassette is in position for cassette 2 and is sensed by optical sensor PHOTO-1 “Cassette 2 In Place”.
10	INPUT	POS	OFF	DICASSETTE_2 _LOAD	Cassette 2 is rotated to align with the front of the machine casting and is ready to accept or remove wafer cassettes. Cylinder “Rotate Cassette 2” is fully extended. Position is detected by sensor HES-7.
11	INPUT	POS	ON	DICASSETTE_2 _OPERATION	Cassette 2 is aligned with the Wet Cassette tub. This is the standard position for lowering the cassettes into the tubs and for picking and returning wafers during production. Cylinder “Rotate Cassette 2” is fully contracted. Position is detected by sensor HES-8.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
12	INPUT	POS	OFF	DIPHOTOHELIC	External sensing device for Tool exhaust. Customer supplied trigger. (Facilities Photohelic).
13	INPUT	POS	OFF	DIOPERATOR_DOOR_UP	Front Access Door. Sensor OMRON-10 cylinder “Operator Door” is in the UP position.
14	INPUT	POS	ON	DIOPERATOR_DOOR_DOWN	Front Access Door. Sensor OMRON-10 cylinder “Operator Door” is in the DOWN position.
15				CHAN15	

NOTE: **Both Sensor Arrays are connected in parallel to each other and to the OPTO 22 racks #2 and #3. Pin 29 on each Array enables the active Array. The output of channel #78 from OPTO22 rack #5 energizes RLY4 (relay #4).**

16	INPUT	POS	ON	DIWAFER_1	Wafer 1 is in cassette 1 and wafer 26 is in cassette 2. Sensor Array H-825.
17	INPUT	POS	ON	DIWAFER_2	Wafer 2 is in cassette 1 and wafer 27 is in cassette 2. Sensor Array H-825.
18	INPUT	POS	ON	DIWAFER_3	Wafer 3 is in cassette 1 and wafer 28 is in cassette 2. Sensor Array H-825.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
19	INPUT	POS	ON	DIWAFER_4	Wafer 4 is in cassette 1 and wafer 29 is in cassette 2. Sensor Array H-825.
20	INPUT	POS	ON	DIWAFER_5	Wafer 5 is in cassette 1 and wafer 30 is in cassette 2. Sensor Array H-825.
21	INPUT	POS	ON	DIWAFER_6	Wafer 6 is in cassette 1 and wafer 31 is in cassette 2. Sensor Array H-825.
22	INPUT	POS	ON	DIWAFER_7	Wafer 7 is in cassette 1 and wafer 32 is in cassette 2. Sensor Array H-825.
23	INPUT	POS	ON	DIWAFER_8	Wafer 8 is in cassette 1 and wafer 33 is in cassette 2. Sensor Array H-825.
24	INPUT	POS	ON	DIWAFER_9	Wafer 9 is in cassette 1 and wafer 34 is in cassette 2. Sensor Array H-825.
25	INPUT	POS	ON	DIWAFER_10	Wafer 10 is in cassette 1 and wafer 35 is in cassette 2. Sensor Array H-825.
26	INPUT	POS	ON	DIWAFER_11	Wafer 11 is in cassette 1 and wafer 36 is in cassette 2. Sensor Array H-825.
27	INPUT	POS	ON	DIWAFER_12	Wafer 12 is in cassette 1 and wafer 37 is in cassette 2. Sensor Array H-825.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
28	INPUT	POS	ON	DIWAFER_13	Wafer 13 is in cassette 1 and wafer 38 is in cassette 2. Sensor Array H-825.
29	INPUT	POS	ON	DIWAFER_14	Wafer 14 is in cassette 1 and wafer 39 is in cassette 2. Sensor Array H-825.
30	INPUT	POS	ON	DIWAFER_15	Wafer 15 is in cassette 1 and wafer 40 is in cassette 2. Sensor Array H-825.
31	INPUT	POS	ON	DIWAFER_16	Wafer 16 is in cassette 1 and wafer 41 is in cassette 2. Sensor Array H-825.
32	INPUT	POS	ON	DIWAFER_17	Wafer 17 is in cassette 1 and wafer 42 is in cassette 2. Sensor Array H-825.
33	INPUT	POS	ON	DIWAFER_18	Wafer 18 is in cassette 1 and wafer 43 is in cassette 2. Sensor Array H-825.
34	INPUT	POS	ON	DIWAFER_19	Wafer 19 is in cassette 1 and wafer 44 is in cassette 2. Sensor Array H-825.
35	INPUT	POS	ON	DIWAFER_20	Wafer 20 is in cassette 1 and wafer 45 is in cassette 2. Sensor Array H-825.
36	INPUT	POS	ON	DIWAFER_21	Wafer 21 is in cassette 1 and wafer 46 is in cassette 2. Sensor Array H-825.
37	INPUT	POS	ON	DIWAFER_22	Wafer 22 is in cassette 1 and wafer 47 is in cassette 2. Sensor Array H-825.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
38	INPUT	POS	ON	DIWAFER_23	Wafer 23 is in cassette 1 and wafer 48 is in cassette 2. Sensor Array H-825.
39	INPUT	POS	ON	DIWAFER_24	Wafer 24 is in cassette 1 and wafer 49 is in cassette 2. Sensor Array H-825.
40	INPUT	POS	ON	DIWAFER_25	Wafer 25 is in cassette 1 and wafer 50 is in cassette 2. Sensor Array H-825.
41				CHAN41	Not Defined
42	INPUT	POS	ON	DISENSOR_ARRAY_1_UP	Cylinder “Sensor Array #1” is in the UP position and is sensed through sensor HES-11.
43	INPUT	POS	OFF	DISENSOR_ARRAY_1_DOWN	Cylinder “Sensor Array #1” is in the DOWN position and is sensed through sensor HES-12.
44	INPUT	POS	ON	DISENSOR_ARRAY_2_UP	Cylinder “Sensor Array #2” is in the UP position and is sensed through sensor HES-13.
45	INPUT	POS	OFF	DISENSOR_ARRAY_2_DOWN	Cylinder “Sensor Array #2” is in the DOWN position and is sensed through sensor HES-14.
46	INPUT	POS	OFF	DIPADDLE_VAC_SW_1	Vacuum between the “paddle 1” (pick side), and a wafer is at, or greater than, the set point (selectable) on vacuum sensor C/VS2(PS3).

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
47	INPUT	POS	ON	DIPADDLE_VAC _SW_2	Vacuum between the “paddle 2” (unload side), and a wafer is at, or greater than, the set point (selectable) on vacuum sensor C/VS2(PS3).
48	OUTP	POS	ON	DOMAIN_AIR	When ON: Main Air (OFA) is ON to C2C Upper and Lower Panels. Energizes Solenoid C/V1B to allow Main Air to Pressure Regulator on lower C2C panel. When OFF: Main Air (OFA) is OFF to C2C Upper and Lower Panels. De-energizes solenoid C/V1B to disable Main Air to Pressure Regulator on lower C2C panel.
49	OUTP	POS	OFF	DOCASSETTE_1 _FS_FILL	When ON**:** Starts Fast Fill DI water flow to Wet Cassette 1 (Normal fill time is ~3 - 5 min.), and disables Slow Fill. Energizes Solenoid C/V2B to allow main air pressure through pneumatic line C040 to SOL1 (Solenoid is in its “held open” position). When OFF**:** Stops Fast Fill DI water flow to Wet Cassette 1 and enables Slow Fill. De-energizes Solenoid C/V2B to stop main air pressure through pneumatic line C049, to SOL 1 (Solenoid is in normally closed position).

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
50	OUTP	POS	OFF	DOCASSETTE_1_FD	Diverts the Normal flow (slow flow) of DI from the wet cassette to the drain line. Allows NO DI flow to the wet cassette while service is being done and still maintain a flow of DI (no DI Dead Legs). When ON: Energizes Solenoid C/V3B to allow main air pressure through pneumatic line C050 to SOL2 (Solenoid is open). When OFF: De-energizes Solenoid C/V3B to disable main air pressure through pneumatic line C050 to SoL2 (Solenoid is in normally closed position).
51	OUTP	POS	OFF	DOCASSETTE_2_FS_FILL	When ON: Enables Fast Fill DI water to wet cassette 2 (Normal fill time is ~3 - 5 min.) Energizes Solenoid C/V4B to allow main air pressure through pneumatic line C051 to SOL3 (Solenoid is open). When OFF: Disables Fast Fill DI water to Wet Cassette 2. De-energizes Solenoid C/V4B to disable main air pressure through pneumatic line C051, to SOL3 (Solenoid is in normally closed position).

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
52	OUTP	POS	OFF	DOCASSETTE_2_FD	Diverts the Normal flow (slow flow) of DI from the wet cassette to the drain line. Allows NO DI flow to the wet cassette while service is being done and still maintain a flow of DI (No DI Dead Legs). When ON: Energizes Solenoid C/V5B to allow main air pressure through pneumatic line C052, to SOL4 (Solenoid is open). When OFF: De-energizes Solenoid C/V5B to disable main air pressure through pneumatic line C052, to SOL4 (Solenoid is in normally closed position).

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
53	OUTP	POS	OFF	DORAISE_ CASSETTE_1	When ON: Raises cassette 1 out of the wet cassette basin to the “Cassette 1 Up” position. Energizes Solenoid C/V6B to allow main air pressure through pneumatic line C053A to Cylinder “Raise Cassette 1” (Cylinder is in extended position). Speed is regulated by metering the cylinder exhaust through “Flow Control” FC8, pneumatic line C053B. When OFF: Lowers Cassette 1 into wet cassette basin to the “Cassette 1 Down” position. De-energizes solenoid C/V6B to allow main air pressure through pneumatic line C053B to cylinder “Raise Cassette 1” (Cylinder is in retracted position). Speed is regulated by metering the cylinder exhaust through “Flow Control” FC7 pneumatic line C053A.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
54	OUTP	POS	OFF	DOROTATE_ CASSETTE_1	When ON: Rotates cassette to the load position (aligned with the front of the machine), ready to receive a cassette. Energizes Solenoid C/V7B to allow main air pressure, through pneumatic line C054B, to Cylinder “Rotate Cassette 1” (Cylinder is in retracted position). Speed is regulated by metering cylinder exhaust through Flow Control FC10, pneumatic line C054a. When OFF: Rotates Cassette to the operation position (aligned to the wet cassette basin), ready to interface with the robot. De-energized, Solenoid C/V7B returns to rest position which enables main air pressure, through pneumatic line C054A to cylinder “Rotate Cassette 1” (Cylinder is in extended position). Speed is regulated by metering cylinder exhaust through Flow Control FC9.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
55	OUTP	POS	OFF	DORAISE_ CASSETTE_2	When ON: Raises cassette 1 out of the wet cassette basin to the “Cassette 1 Up” position. Energizes solenoid C/V8B to allow main air pressure through pneumatic line C055A to cylinder “Raise Cassette 1” (Cylinder is in extended position). Speed is regulated by metering the cylinder exhaust through “Flow Control” FC12, pneumatic line C055B. When OFF: Lowers cassette 1 into the wet cassette basin to the “Cassette 1 Down” position. De-energizes solenoid C/V8B to allow main air pressure through pneumatic line C0-55B to cylinder “Raise Cassette 1” (Cylinder is in retracted position). Speed is regulated by metering the cylinder exhaust through “Flow Control” FC711, pneumatic line C055A.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
56	OUTP	POS	OFF	DOROTATE_ CASSETTE_2	When ON: Rotates Cassette to the Load position (aligned with the front of the machine), ready to receive a cassette. Energizes solenoid C/V9B to allow main air pressure through pneumatic line C056B to cylinder “Rotate Cassette 1” (Cylinder is in its retracted position). Speed is regulated by metering exhaust through “Flow Control” FC14, Pneumatic line C056A. When OFF: Rotates cassette to the Operation position (aligned to the wet cassette basin), ready to interface with the robot. De-energized solenoid C/V9B returns to rest position which enables main air pressure, through pneumatic line C056A, to Cylinder “Rotate cassette 1” (Cylinder is in its extended position). Speed is regulated by metering cylinder exhaust through Flow Control FC13, pneumatic line C056B.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
57	OUTP	POS	OFF	DOQUICK_ DUMP_1	When ON: Opens quick drain valve to drain DI water from wet cassette 1. Energizes solenoid C/V10B to allow main air pressure through pneumatic line C057 to SOL5 (Solenoid is open). When OFF: Closes drain valve to cassette 1. De-energizes solenoid C/V10B to stop main air pressure through pneumatic line C0057 to SOL5 (Solenoid is in normally closed position).
58	OUTP	POS	OFF	DOQUICK_ DUMP_2	When ON: Opens drain valve to drain DI water from wet cassette 2. Energizes solenoid C/v11B to allow main air pressure through pneumatic line C058 to SOL6 (Solenoid is open). When OFF: Closes drain valve to cassette 2. De-energizes Solenoid C/11B to stop main air pressure through pneumatic line C058 to SOL6 (Solenoid is in normally closed position).
59	OUTP	POS	OFF	DOCHAN59	Undefined
60	OUTP	POS	OFF	DOCHAN60	Undefined

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
61	OUTP	POS	OFF	DOMAIN_ SLURRY_1	When ON: Enables DI (low pressure) water to the MP Slurry Modules. Energizes Solenoid DV2-1 to allow low pressure DI through fluid lines to all 4 MP slurry modules. When OFF: Disables DI water to the MP slurry modules. De-energizes solenoid DV2-1 to stop low pressure DI to all 4 MP Slurry Modules.
62	OUTP	POS	OFF	DOFLUSH_ SLURRY_2	When ON: Enables low pressure DI water to flush slurry from the slurry 2 delivery/metering system. Energizes solenoid Dv2-2 to allow DI through the slurry lines to all 4 MP slurry modules.
63	OUTP	POS	OFF	DOFLUSH_ SLURRY3A	When ON: Enables low pressure DI water to flush slurry from the slurry 3A delivery/metering system. Energizes solenoid DV2-3 to allow DI through fluid line, to all 4 MP slurry modules.
64	OUTP	POS	OFF	DOFLUSH_ SLURRY3B	When ON: Enables low pressure DI water to flush slurry from the slurry 3B delivery/metering system. Energizes solenoid DV2-4 to allow DI through the fluid lines to all 4 MP slurry modules.
65	OUTP	POS	OFF	DOMAIN_ SLURRY2	When ON: Enables slurry 2 to all Slurry2 systems. Energizes solenoid DV2-5 to allow slurry 2 through fluid line, to filter, and to all 4 MP slurry modules.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
66	OUTP	POS	OFF	DOMAIN_ SLURRY3A	When ON: Enables slurry 3A to all slurry 2 systems. Energizes solenoid DV2-6 to allow Slurry 3A through fluid lines, to filter, and to all 4 MP slurry modules.
67	OUTP	POS	OFF	DOMAIN_ SLURRY3B	When ON: Enables Slurry 3B to all Slurry 3B systems. Energizes Solenoid DV2-7 to allow Slurry 3B through the fluid lines, to filter, and to all 4 MP Slurry Modules.
68	OUTP	POS	OFF	DOCHAN68	Undefined.
69	OUTP	POS	OFF	DOPADDLE_ VAC_1	When ON: Vacuum is ON at the pick side of the wand. Energizes solenoid C/V1T to enable OFA across the vacuum generator 1. Vacuum is then routed to the wand through the yellow tube.

NOTE: **Paddle_air_1 must be OFF to create vacuum at the wand.**

70	OUTP	POS	OFF	DOPADDLE_ AIR_1	When ON: Enables air (OFA) to be ON at the pick side of the wafer wand. Energizes solenoid C/V2T to enable OFA through the yellow tube to the wand.

NOTE: **Paddle_Vac_1 must be OFF to correctly release the wafer from the wand.**

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
71	OUTP	POS	OFF	DOPADDLE_ VAC_2	When ON: Enables vacuum to be ON at the pick side of the wand. Energizes solenoid C/V3T to enable OFA across the vacuum generator 2. Vacuum is then routed to the wand through the yellow tube.

NOTE: **Paddle_air_2 must be OFF to create vacuum at the wand.**

72	OUTP	POS	OFF	DOPADDLE_ AIR_2	When ON: Enables air (OFA) to be ON at the pick side of the wand. Energizes solenoid C/V4T to enable OFA through the yellow tube to the wand.

NOTE: **Paddle_Vac_2 must be OFF to correctly release the wafer from the wand.**

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
73	OUTP	POS	OFF	DOLOWER_ SENSOR_ ARRAY_1	When ON: Lowers the wafer sensor array 1 to sense the wafers in cassette 1. Energizes solenoid C/V5G to enable OFA through tube C073A, through Flow Control FC1 (free flow) through check valve PCV2 (energized through the pilot, and unregulated), to cylinder “Sensor Array #1”. Speed is controlled by metering cylinder exhaust through Flow Control FC2. When OFF: Raises the wafer sensor array 1 to the up/safe position. De-energizes solenoid C/V5T to enable OFA through tube C073B, through check valve PCV2 (free flow), through flow control FC2 (free flow) to cylinder Sensor Array #1. Speed is controlled by metering cylinder exhaust through flow control FC1.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
74	OUTP	POS	OFF	DOLOWER_ SENSOR_ ARRAY_2	When ON: Lowers the wafer sensor array 2 to sense the wafers in cassette 2. Energizes solenoid C/V6T to enable OFA through the C074A, through flow control FC3 (free flow) through check valve PCV3 (energized through the pilot, and unregulated), to cylinder “sensor array #2. Speed is controlled by metering cylinder exhaust through Flow Control FC4. When OFF: Raises the wafer sensor array 2 to the up/safe position. De-energizes solenoid C/V6T to enable OFA through tube C074B, through check valve PCV3 (free flow), through Flow Control FC4 (free flow) to Cylinder Sensor Array #2. Speed is controlled by metering cylinder exhaust through Flow Control FC3.
75	OUTP	POS	OFF	DOCLOSE_ OPERATOR_ DOOR	When ON: Lowers the operator door to the closed position. Energizes solenoid C/V7T to enable OFA through tube C075A, through flow control FC5 (free flow) to cylinder “Operator Door”. Speed is controlled by metering cylinder exhaust through Flow Control FC6. When OFF: Raises the operator door to the open position. De-energizes solenoid C/V7T to enable OFA through tube C075B, through flow control FC6 (free flow), to cylinder “Operator Door”. Speed is controlled by metering cylinder exhaust through flow control FC5.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
76	OUTP	POS	OFF	DOVALVE_ C/ V8T	Spare valve, unused at this time.
77	OUTP	POS	OFF	DOCHAN77	Undefined.
78	OUTP	POS	OFF	DOSENSOR_ ARRAY_2_ SELECT	When ON: Electrically selects the inputs from the Sensor Array 2. Enables Relay RLY4 to complete circuit 2102 (normally open), and breaks circuit 2103 (normally closed). This circuit is not self latching.
79	OUTP	POS	OFF	DOCHAN79	Undefined.

NOTE:

All pad conditioner I/O names are different for C1_(Pad Conditioner1) and C2_(Pad Conditioner 2).

For Pad Conditioner Robot troubleshooting use the Pad Conditioner Wiring Diagram.

80	INPUT	POS	OFF	DIC1_HLS	NSK is sensing the Pad Conditioner Arm is at Home position.
81	INPUT	POS	OFF	DIC1_ARM_UP	ARM UP: NSK is sensing the Pad Conditioner Arm is at Arm Up position.
82	INPUT	POS	OFF	DIC1_NSK_ DRDY	DEVICE READY: NSK Device Ready. Will come on after a channel 88 C1_NSK_MRDY is ON.
83	INPUT	POS	OFF	DIC1_NSK_ IPOS	IN POSITION: NSK motor has completed its commanded move and is In Position.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
84	OUTP	POS	OFF	DOCHAN84	Undefined.
85	OUTP	POS	OFF	DOCHAN85	Undefined.
86	OUTP	POS	OFF	DOCHAN86	Undefined.
87	OUTP	POS	OFF	DOCHAN87	Undefined.
88	OUTP	POS	OFF	DOC1_NSK_ MRDY	MOTOR READY: Toggles the NSK servo ON and OFF.
89	OUTP	POS	OFF	DOC1_NSK_ RUN	RUN: Instructs the NSK Controller to start program moves. Toggle ON to start move. Toggle OFF to change program to next desired move.

NOTE:

PAD CONDITIONER 1:
Combinations of the Program command movements give the Pad Conditioner its complete motion.

As Pad Conditioner is in programmed motion, the input indicators (X), will toggle between Program Inputs as defined by the operating program.

When these inputs are on: Command position

none	CH0	Home
0	1	Park
1	2	MP1 sweep out
0,1	3	MP1 sweep in
1,3	10	MP2 sweep out
0, 1, 3	11	MP2 seep in

This follows a standard binary configuration.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
90	OUTP	POS	OFF	D0C1_NSK_ PROG0	PROGRAM 0: Binary 1's position.
91	OUTP	POS	OFF	DOC1_NSK_ PROG1	PROGRAM 1: Binary 2's position.
92	OUTP	POS	OFF	DOC1_NSK_ PROG2	PROGRAM 2: Binary 4's position.
93	OUTP	POS	OFF	DOC1_NSK_ PROG3	PROGRAM 3: Binary 8's position.
94	OUTP	POS	OFF	DO-PC1_NSK_RST	RESET: Reset pad conditioner servo motor. Clears error messages.
95	OUTP	POS	OFF	DOCHAN95	Undefined.
96	OUTP	POS	OFF	DOC1_LOWER_ ARM	LOWER ARM: When ON: Allows the pad conditioning arm to lower (by gravity) onto the pad. Energizes solenoid P/V1B, removing air pressure from cylinder "IN PAD1". When OFF: Raises Pad conditioning arm to the C1_ARM_UP position. De-Energizes solenoid P/V1B, enabling air pressure through Needle Valve NV1, to cylinder "IN PAD1".

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
97	OUTP	POS	OFF	DOMICRO_ SPRAY1	Box 1 Spray Jets: When ON: Jets spray DI water on wafers. Energizes solenoid P/V2B, enabling air pressure to solenoid SOL7 (normally closed/ held open), allowing DI to the spray box 1 jets. When OFF: DI water spray through jets OFF.
98	OUTP	POS	OFF	DOPC1_BRUSH _RINSE	DI rinse through the pad conditioning brush: When ON: DI rinse water is dispensed through the pad conditioning brush. Energizes solenoid DV2-8 (normally closed, held open), enabling DI to flow to the brush. When OFF: DI water flow is OFF.
99	OUTP	POS	OFF	DOCHAN99	Undefined.
100	OUTP	POS	OFF	DOCHAN100	Undefined.
101	OUTP	POS	OFF	DOCHAN101	Undefined.
102	OUTP	POS	OFF	DOCHAN102	Undefined.
103	OUTP	POS	OFF	DOCHAN103	Undefined.
104	OUTP	POS	OFF	DOCHAN104	Undefined.
105	OUTP	POS	OFF	DOCHAN105	Undefined.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
106	OUTP	POS	OFF	DOCHAN106	Undefined.
107	OUTP	POS	OFF	DOCHAN107	Undefined.
108	OUTP	POS	OFF	DOCHAN108	Undefined.
109	OUTP	POS	OFF	DOCHAN109	Undefined.
110	OUTP	POS	OFF	DOCHAN110	Undefined.
111	OUTP	POS	OFF	DOCHAN111	Undefined.

NOTE:

All pad conditioner I/O names are different for C1_(pad conditioner 1) and C2_(Pad conditioner 2).

For pad conditioner robot troubleshooting use the pad conditioner wiring diagram.

112	INPUT	POS	OFF	DIC2_HLS	NSK is sensing the pad conditioner arm is at home position.
113	INPUT	POS	OFF	DIC2_ARM_UP	Arm Up: NSK is sensing the pad conditioner arm is at Arm Up position.
114	INPUT	POS	OFF	DIC2_NSK_ DRDY	Device Ready: NSK Device Ready. Will come on after a channel 120 “C2_NSK_MRDY” is enabled.
115	INPUT	POS	OFF	DIC2_NSK_ IPOS	In Position: NSK motor has completed its commanded move and is In Position.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
116	OUTP	POS	OFF	DOCHAN116	Undefined.
117	OUTP	POS	OFF	DOCHAN117	Undefined.
118	OUTP	POS	OFF	DOCHAN118	Undefined.
119	OUTP	POS	OFF	DOCHAN119	Undefined.
120	OUTP	POS	OFF	DOC2_NSK_ MRDY	Motor Ready: Toggles the NSK servo ON and OFF.
121	OUTP	POS	OFF	DOC2_NSK_ RUN	Run: Instructs the NSK Controller to start program moves. Toggle ON to start move. Toggle OFF to change program to next desired move.

NOTE:

PAD CONDITIONER 2: Combinations of the program command movements give the pad conditioner its complete motion.

As pad conditioner is in programmed motion, the input indicators (X), will toggle between program inputs as defined by the operating program.

When these inputs are on: Command Position:

none	CH0	Home
0	1	Park
1	2	MP3 sweep out
0, 1	3	MP3 sweep in
1, 3	10	MP4 sweep out
0, 1, 3	11	MP4 sweep in

This follows a standard binary configuration.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
122	OUTP	POS	OFF	DOC2_NSK_ PROG0	Program 0: Binary 1's position.
123	OUTP	POS	OFF	DOC2_NSK_ PROG1	Program 1: Binary 2's position.
124	OUTP	POS	OFF	DOC2_NSK_ PROG2	Program 2: Binary 4's position.
125	OUTP	POS	OFF	DOC2_NSK_ PROG3	Program 3: Binary 8's position.
126	OUTP	POS	OFF	DOPC2_NSK_ RST	Reset: Resets pad conditioner servo motor. Clears error messages.
127	OUTP	POS	OFF	DOCHAN127	Undefined.
128	OUTP	POS	OFF	DOC2_LOWER_ ARM	Lower Arm: When ON: Allows the pad conditioning arm to lower (by gravity) onto the pad. Energizes solenoid P/V3B, removing air pressure from cylinder "in pad2". When OFF: Raises pad conditioning arm to the "C2_ARM_UP position". De-energizes Solenoid P/V2B, enabling air pressure through needle valve NV2, to cylinder "in pad2".

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
129	OUTP	POS	OFF	DOMICRO_ SPRAY2	Box 2 Spray Jets: When ON: Jets spray DI water on wafers. Energizes solenoid P/V4B, enabling air pressure to solenoid SOL8 (normally closed/ held open), allowing DI to the spray box2 jets. When OFF: DI water spray through jets OFF.
130	OUTP	POS	OFF	DOC2_BRUSH_ RINSE	DI rinse through the pad conditioning brush: When ON: Energizes solenoid DV2-9 (normally closed, held open), enabling DI to flow to the brush. When OFF: DI water flow is OFF.

Continued on next page

C2C Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
131	OUTP	POS	OFF	DOCHAN131	Undefined.
132	OUTP	POS	OFF	DOCHAN132	Undefined.
133	OUTP	POS	OFF	DOCHAN133	Undefined.
134	OUTP	POS	OFF	DOCHAN134	Undefined.
135	OUTP	POS	OFF	DOCHAN135	Undefined.
136	OUTP	POS	OFF	DOCHAN136	Undefined.
137	OUTP	POS	OFF	DOCHAN137	Undefined.
138	OUTP	POS	OFF	DOCHAN138	Undefined.
139	OUTP	POS	OFF	DOCHAN139	Undefined.
140	OUTP	POS	OFF	DOCHAN140	Undefined.
141	OUTP	POS	OFF	DOCHAN141	Undefined.
142	OUTP	POS	OFF	DOCHAN142	Undefined.
143	OUTP	POS	OFF	DOCHAN143	Undefined.

C2C Analog I/O

Table B-3. C2C Analog I/O

Chan	Type	Logic	Initial	Name	Description
0	INPUT	POS	ON	AIWAND_POS_1	Reads position of wand (distance from sensor, cant, and twist).
1	INPUT	POS	ON	AIWAND_POS_2	Reads position of wand (distance from sensor, cant, and twist).

MP Discrete I/O

Table B-4. MP Discrete I/O

Chan	Type	Logic	Initial	Name	Description
0	INPUT	POS	OFF	DIESTOP	
1	INPUT	POS	OFF	DIEP_DETECT	END POINT DETECT
2	INPUT	POS	OFF	DICHAN2	Undefined
3	INPUT	POS	OFF	DICHAN3	Undefined
4	INPUT	POS	OFF	DICHAN4	Undefined
5	INPUT	POS	OFF	DICHAN5	Undefined
6	INPUT	POS	OFF	DICHAN6	Undefined
7	INPUT	POS	OFF	DICHAN7	Undefined
8	OUTP	POS	OFF	DOSLURRY_ ENABLE	When ON: Supplies Line Voltage (2L1) to Motor Controller MC3. Energizes Relay RLY2 (MP High Voltage Panel), which closes contact 6 (L1 supply) to contact 4 along wire #100, through TBS Pin #20, to Motor Controller MC1, 2, and 3. When OFF: Isolates line voltage from MC3.
9	OUTP	POS	OFF	DOSPINDLE_ ENABLE	When ON: Supplies COM to Toshiba controller. Energizes Relay RLY3 (MP Low Voltage Panel, back side), which closes contact 4 (COM supply) to contact 6 along wire #1006, to Motor Controller VF1 input F. When OFF: Isolates COM from input F.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
10	OUTP	POS	OFF	DOCHAN10	Undefined
11	OUTP	POS	OFF	DOCHAN11	Undefined
12	OUTP	POS	OFF	DOCHAN12	Undefined
13	OUTP	POS	OFF	DOCHAN13	Undefined
14	OUTP	POS	OFF	DOPOC_RESET	Controls the reset command to the SmartStep controller. When ON: The controller has failed to initialize.
15	OUTP	POS	OFF	DOPOC_ RUNCMD	Run Command Output When ON: Oscillates the polish platen at the last speed and range settings sent to the controller (when Channel 14 DOPOC_RESET is OFF).
16	INPUT	POS	OFF	DIAIR_ PRESSURE	Regulated Air (OFA) is present in the MP panel equal to, or greater than the set value (selectable). Main Tool air must be ON and Channel 32 MAIN_AIR must be ON.
17	INPUT	POS	OFF	DIPOLISH_ PARK	Lower Polish Drive is in Park position. Optical sensor is pointing through the hole in the polish drive assembly, and not sending a Positive signal back to Rack#2. X = Hole not aligned to sensor [ ] = Hole is aligned to sensor
18	INPUT	POS	OFF	DILEAKDETECT	Fluid has accumulated in the bottom of the Slurry Box and Tripped Sensor “LEAK_DETECTOR”.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
19	INPUT	POS	OFF	DISLURRY2_ WASTE	Slurry 2 drain lines are in a normal condition, Sensor DIV1_OPEN is not tripped, and slurry is going down the Waste line. Channel 35 RECYCLE_SLURRY2 is OFF.
20	INPUT	POS	OFF	DISLURRY2_ RECYCLE	Slurry 2 drain lines are in an energized condition, Sensor DIV1_CLOSED is not tripped, and slurry is going down the Recycle line. Channel 35 RECYCLE_SLURRY2 is ON.
21	INPUT	POS	OFF	DISLURRY3_ WASTE	Slurry 3 drain lines are in a normal condition, Sensor DIV2_OPEN is not tripped, and slurry is going down the Waste line. Channel 36 RECYCLE_SLURRY3 is OFF.
22	INPUT	POS	OFF	DISLURRY3_ RECYCLE	Slurry 3 drain lines are energized, Sensor DIV2_CLOSED is not tripped, and slurry is going down the Recycle line. Channel 36 RECYCLE_SLURRY3 is ON.
23	INPUT	POS	OFF	DICHAN23	Undetermined
24	INPUT	POS	OFF	DISHEILD_ TRIPPED_1	Sensor “SHIELD_1” located on the MP Polish shield has been tripped. Must be OFF for MP to function.
25	INPUT	POS	OFF	DISHEILD_ TRIPPED_2	Sensor “SHIELD_2” located on the MP Polish shield has been tripped. Must be OFF for MP to function.
26	INPUT	POS	OFF	DISHEILD_ TRIPPED_3	Sensor “SHIELD_3” located on the MP Polish shield has been tripped. Must be OFF for MP to function.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
27	INPUT	POS	OFF	DIWAFER_HEAD_UP	Proximity sensor “WAFER_UP” located above the Wafer Head Cylinder has been tripped, Wafer Head is in the Up (safe) position.
28	INPUT	POS	OFF	DIWAFER_HEAD_DOWN	Proximity sensor “WAFER_DN” located above the Wafer Head Cylinder has been tripped, Wafer Head is in the Down (polish) position.
29	INPUT	POS	OFF	DIWAFER_SPEED	Park Sensor: Optical Sensor “W_SPD” located above the Wafer Head Cylinder is aligned with the reflective tape on the cut out of the Wafer Head Actuator. X = Sensor Aligned [ ] = Sensor not Aligned
30	INPUT	POS	OFF	DIWAFER_CHUCKED	Vacuum Sensor “SW7” located in the upper MP pneumatics panel is sensing vacuum at or greater than set point (selectable).
31	INPUT	POS	OFF	DICHAN31	Undetermined
32	OUTP	POS	OFF	DOMAIN_AIR	MP Pneumatic Panel Main Air: When ON: Energizes Solenoid M/V1B enabling Main Air through the PM Regulator to the MP components. When OFF: Isolates Main Air from the MP components.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
33	OUTP	POS	OFF	DOPOLISH_AIR	When ON: Energizes Solenoid M/V3B enabling regulated air from SMC Controller EP2 through Filter ??, to Polish Diaphragm. When OFF: Isolates Controlled Air from Polish Diaphragm.
34	OUTP	POS	OFF	DOPAD_AIR	When ON: Energizes Solenoid M/V3B enabling Main Air through Pressure Regulator R2, to the Polish Diaphragm. Breaks the surface tension between the wafer and pad, before the wand picks the wafer. When OFF: Isolates Main Air from Polish Diaphragm.
35	OUTP	POS	OFF	DORECYCLE_ SLURRY2	When ON: Energizes Solenoid M/V4B enabling Main Air to Open Valve DV?-? (Normally Closed, Held Open). Trips Sensor “DIV1_CLOSED”, channeling slurry down the Recycle drain. When OFF: Isolates Main Air from Valve DV?-? (Normally Closed). Trips Sensor “DIV1_OPEN”, channeling slurry down the Waste drain.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
36	OUTP	POS	OFF	DORECYCLE_ SLURRY3	When ON: Energizes Solenoid M/V5B enabling Main Air to Open Valve DV?-? (Normally Closed, Held Open). Trips Sensor “DIV2_CLOSED”, channeling slurry down the Recycle drain. When OFF: Isolates Main Air from Valve DV?-? (Normally Closed). Trips Sensor “DIV2_OPEN”, channeling slurry down the Waste drain.
37	OUTP	POS	OFF	DOCHAN37	Undefined
38	OUTP	POS	OFF	DOWAFER_AIR	When ON: Energizes Solenoid M/V7T enabling Regulated Air from SMC “EP1” to flow through PIAB Trap filter, through the Rotary Coupling, to the Wafer Carrier, supplying Backside Air for polishing. When OFF: Isolates Regulated Air from Wafer Carrier.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
39	OUTP	POS	OFF	DOTOP_OPEN	When ON: Energizes Solenoid M/V8T enabling MP Air (OFA) to move the Wafer Head Cylinder to the Down position. Also to the Check Valve “Pilot VC” opening up a return path for the Cylinder exhaust that is now routed through Check Valve “Pilot VC” (free flow), Flow Control FC1 (regulated), back through Solenoid MV8T and into the main exhaust lines. When OFF: De-energizes Solenoid M/V8T enabling MP Air through Flow Control FC1 (free flow), through Check Valve “Pilot PV” (free flow), to move the Wafer Head Cylinder into the Up position. Speed is not regulated in this direction.
40	OUTP	POS	OFF	DOWAFER_ VACUUM	Holds the Wafer to the Wafer Carrier. When ON: Energizes Solenoid M/V9T enabling Vacuum generated at the Vac Generator #?? Vacuum is now available for “WAFER_VACUUM_ENABLE” usage.

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
41	OUTP	POS	OFF	DOWAFER_VAC _ ENABLE	When ON: Energizes Solenoid M/V10T enabling Main Air to flow through the Vacuum Generator #??. through PIAB Trap filter, to the Wafer Carrier. Channel 40 “WAFER_VACUUM” must be ON if Vacuum is to be tested. When OFF: Isolates Vacuum from the Wafer Carrier.
42	OUTP	POS	OFF	DOUNLOCK_ MAINT_ACCESS	When ON: Energizes Solenoid M/V11T enabling MP Air to extend Bimba Cylinder “UNLOCK_MAINT_ACCESS”, locking the side Polish Access Doors. When OFF: Isolates MP Air from the Bimba lock Cylinder, unlocking the access doors.
43	OUTP	POS	OFF	DOCHAN43	Undefined
44	OUTP	POS	OFF	DOCHAN44	Undefined

Continued on next page

MP Discrete I/O, continued

Chan	Type	Logic	Initial	Name	Description
45	OUTP	POS	OFF	DOSPRAY_RING	When ON: Energizes Solenoid “SPRAY” enabling DI water (High Pressure) to be sprayed out around the Wafer Polish Shield. When OFF: Isolates DI water from the Spray Shield. (No leakage is allowed during normal polishing, polish characteristics will be changed.)
46	OUTP	POS	OFF	DOPURGE	When ON: Energizes Solenoid “PURGE” enabling DI water (High Pressure) to come out of the Polish Pad center. When OFF: Isolates DI water from the Polish Pad. (No leakage is allowed during normal polishing, polish characteristics will be changed.)
47	OUTP	POS	OFF	DORINSE	When ON: Energizes Solenoid “DIH2O” enabling DI water (High Pressure) to come out around the circumference of the Polish Bell. When OFF: Isolates DI water from around the Polish Bell. (No leakage is allowed during normal polishing, polish characteristics will be changed.)

MP Analog I/O

Table B-5. MP Analog I/O

Chan	Rack	Type	Logic	Initial	Name	Description
0	3	INPUT	4-20 mA	0 V	AIWAFER_ TRANSDUCER	Displays Upper Wafer polish pressure. Monitors Air Pressure (OFA) that creates back pressure during wafer polish. Pressure is monitored through “WAFER_ TRANSDUCER” PX1. Requires occasional calibration, see “Pad Conditioner Sensor Verification” on page 14-87.

NOTE:

When entering or reading analog pressure values from this screen, the thousands position equals a whole number.

Examples:

1000 = 1 PSI
4000 = 4 PSI
2500 = 2.5 PSI

Continued on next page

MP Analog I/O, continued

Chan	Rack	Type	Logic	Initial	Name	Description
1	3	INPUT	4-20 mA	0V	AIPOLISH_ TRANSDUCER	Displays Lower Polish pad pressure. Monitors Air Pressure (OFA) that creates polish pressure during wafer polish. Pressure is monitored through “POLISH_ TRANSDUCER” PX2. Requires occasional calibration, see “Pad Conditioner Sensor Verification” on page 14-87.
2						OPEN
3						OPEN
4						OPEN
5						OPEN

Continued on next page

MP Analog I/O, continued

Chan	Rack	Type	Logic	Initial	Name	Description
6	3	OUTP	0-10	0V	AOWAFER_ PRESSURE	Displays selected Upper Wafer Polish pressure setting. When a value is entered into the Value column a voltage is sent to Transducer “WAFER_PRESSURE” EP1.

NOTE: **For air pressure to actually be ON, CHAN33 “POLISH_AIR” must be toggled ON.**

7	3	OUTP	0-10V	0V	AOPOLISH_ PRESSURE	Displays selected Lower Polish Pad pressure setting. When a value is entered into the Value column a voltage is sent to Transducer “POLISH_PRESSURE” EP2.

NOTE: **For air pressure to actually be ON, CHAN34 “PAD_AIR” must be toggled ON.**

Continued on next page

MP Analog I/O, continued

Chan	Rack	Type	Logic	Initial	Name	Description
8						OPEN
9						OPEN
10						OPEN
11						OPEN

NOTE:

When entering a analog value for slurry flow from this screen, the number entered equals the number of millimeters per minute.

100 = 100 milliliters per minute
400 = 400 milliliters per minute
250 = 250 milliliters per minute

12	4	OUTP	0-10 V	0V	AOSLURRY_ PUMP1	Displays selected milliliters per minute settings. When a value is entered into the Value column a voltage is sent to Motor Controller MC1.

NOTE:

CHAN8 SLURRY_ENABLE must be toggled ON.

Continued on next page

MP Analog I/O, continued

Chan	Rack	Type	Logic	Initial	Name	Description
13	4	OUTP	0-10 V	0V	AOSLURRY_ PUMP2	Displays selected milliliters per minute settings. When a value is entered into the Value column a voltage is sent to Motor Controller MC2.

NOTE: **CHAN8 SLURRY_ENABLE must be toggled On.**

14	4	OUTP	0-10 V	0V	AOSLURRY_ PUMP3	Displays selected milliliters per minute settings. When a value is entered into the Value column a voltage is sent to Motor Controller MC3.

NOTE: **CHAN8 SLURRY_ENABLE must be toggled On.**

When entering a analog value for Spindle RPM's:
2800 = 16 rpm's for the Carrier
2800 = 280 rpm's for the Polish Pad (17.7 to 1 ratio)

Continued on next page

MP Analog I/O, continued

Chan	Rack	Type	Logic	Initial	Name	Description
15	4	OUTP	0-10 V	0V	AOSPINDLE_ SPEED	Displays selected Spindle RPM settings. When a value is entered into the value column a signal is sent to the Toshiba Motor Controller. The controller then regulates and monitors the speed internally.

NOTE: **CHAN 9 SPINDLE_ENABLE must be toggled ON.**

Appendix C

Mistic Driver Codes

Contents

This chapter contains the following topics:

Topic	See Page
Mistic Driver Error Codes	C-2
I/O Driver Generated Errors	C-5
G4LC32 Pass-Thru Errors	C-7
Servo Motion Control Unit Errors	C-9
Additional Error Codes	C-13

Mistic Driver Error Codes

Table C-1. Mistic Driver Error Codes

Error	Name	Definition
-1	Undefined Command Error	This error code indicates that the mistic I/O Unit received a command letter that it did not understand. This may indicate that a new command that was added to the driver is not supported by an older I/O unit or that a command for one type of I/O unit was actually sent to an I/O unit of a different type (analog command sent to a digital board).
-2	mistic 200 I/O Unit Detected A Checksum Error	This error code indicates a problem with the communications link caused a checksum error when a message from the host was sent to the I/O unit. checksum errors often occur when the Local Bus or RS-485 network is not wired, terminated, or biased properly. Make sure of the following: 1. Twisted-pair cable with at least two twists per inch is used for remove I/O Units. 2. The link is routed in a daisy-chain fashion, NOT a “star” type distribution. 3. The link is terminated at the endpoints and NOT in the middle. 4. The length of the cable does not exceed the length defined in the I/O unit specification.
-3	mistic 200’s Buffer Was Overrun	This error indicates that the I/O unit received more characters than were expected. This may occur because of improper biasing of remote links combined with an electrically noisy environment. See recommendations described for a -2 error.

Continued on next page

Mistic Driver Error Codes, continued

Error	Name	Definition
-4	Device Lost Power Since Last Message	This error indicates that a power failure occurred and the I/O unit went through a reset cycle. Configuration parameters may have been lost unless they were stored in the I/O unit's EEPROM. This error can only be cleared by issuing a "Power Up Clear" (0) command. Remember to re-configure the unit and download PID parameters and Event/Reaction commands where necessary.
-5	Error In A Data Field	This error occurs when the I/O unit receives a message that does not contain enough data characters for that command. This may be due to sending a digital command to an analog I/O Unit or vice-versa. It also may indicate a driver version that does not match the firmware of an I/O unit because of a change to the command structure.
-6	A Serial Watchdog Occurred Since Last Message	This is a flag which indicates that the I/O unit went to a watchdog state because of inactivity on the communications link (local or remote) for a specified length of time. The command that was sent which received this response is not executed. Since the watchdog state may be different than what the host had previously setup, it may be necessary to rewrite that output. If you receive this error often, you may wish to change the time-out period using the watchdog command. Under normal operations, this error should only occur after a recovery from a disconnection to the host or the communications link.
-7	Invalid Data - Limits Sent Are Out of Range	This error indicates that at least one of the data fields in the command message contains an illegal value. Make sure that the values sent are within the range allowed by the configuration for that channel or loop.
-8	Reserved	

Continued on next page

Mistic Driver Error Codes, continued

Error	Name	Definition
-9	Invalid Module Type Was Specified	This error occurs when a command is sent that requires a channel to be configured differently than it is presently. For instance; a command to turn on an output on a channel that is configured as an input.
-10	Invalid Event Type Was Specified	This error occurs when an attempt is made to enable an event entry or define a reaction before the event has been defined (NULL entry).
-11	Invalid Delay Specified	This error occurs with digital I/O units when an attempt is made to start a square wave or generate N pulses, or a TPO, with a delay time less than 10mS on more than eight output positions.

Continued on next page

I/O Driver Generated Errors

Table C-2. I/O Driver Generated Errors

Error	Name	Definition
-20	Invalid Command Error	This error occurs when the command variable contains a value that is not supported by the driver.
-22	Data Range Error	This error indicates that an invalid data value was used with a 900 series driver command. Examples include invalid port numbers, baud rates, and time-out ranges.
-25	Invalid Address Error	This error occurs when the address variable contains a value that is less than 0 or greater than 255.
-29	Driver Time-out Error	This error indicates that a command was sent to an I/O unit and a response was NOT receive within the delay period used by the driver. A -29 error may occur because of the following: 1. The address variable contains an address of an I/O unit that doesn't exist. Make sure variable and address jumpers on I/O unit are correct. 2. No power or bad power to the I/O unit. 3. A problem with the communications cables. Make sure continuity and polarity are correct. Make sure you use correct cable types with the proper termination and bias. 4. If both the transmit and receive LED's flash on the I/O unit, then make sure the following is correct: Incorrect communications interrupt line selected or another adapter card using the same address/interrupt line. 5. Turn-Around delay may be set too short for the baud rate and command selected. A reset command (1) and a "store configuration to EEPROM" command (3) may take up to two seconds to execute.

Continued on next page

I/O Driver Generated Errors, continued

Error	Name	Definition
-31	Driver Detected a Checksum Error in the Response	This error code indicates a problem with the communications link caused a checksum error when a response from the I/O unit was received. See recommendations described for a -2 error.
-33	Driver Send Error	The driver had a problem transmitting a message. This may occur when there is a problem with the serial or local adapter card. Make sure the address and interrupt line for the adapter card do not conflict with any other adapter in the PC.
-36	General G4LC32 Error	This error code indicates that the G4LC32 Controller received a message it did not understand. Make sure that you are in pass-thru mode when sending commands to the I/O units through the G4LC32.

G4LC32 Pass-Thru Errors

Table C-3. G4LC32 Pass-Thru Errors

Error	Name	Definition
-41	Bad Port Number	The G4LC32 reports that the specified port number is illegal in the Pass-Thru preamble. This error should never occur, because driver command 904 checks for valid numbers.
-42	G4LC32 Controller Detected a CRC Error	This error code indicates a problem with the communications link caused a CRC error when a message from the host was sent to the G4LC32 Controller. Checksum error often occur when the RS-485 network is not wired, terminated, or biased properly. Make sure of the following: 1. Twisted-pair cable with at least two twists per inch is used for mistic 200 controller RS-485 serial ports. 2. The link is routed in a daisy-chain fashion, NOT a “star” type distribution. 3. The link is terminated at the endpoints and NOT in the middle. 4. The length of the cable does not exceed the length defined in the G4LC specifications.
-43	G4LC32 Buffer Overrun - From I/O unit	This error indicates that the G4LC32 received more characters from the I/O unit than were expected. This may occur because of improper biasing of remote links combined with an electrically noisy environment. See recommendations described for a -42 error.
-44	G4LC32 Lost Power Since Last Message	This error indicates that a power failure occurred and the mistic 200 controller went through a reset cycle. This error can only be cleared by issuing a “Power Up Clear” (0) command to the G4LC32. Remember to send this command in the binary mode, NOT in the PASS-THRU mode.

Continued on next page

G4LC32 Pass-Thru Errors, continued

Error	Name	Definition
-45	Bad CRC Length Error	This error indicates that the mistic 200 controller received more or less characters than were expected when doing the CRC calculations. This may occur because of improper jumper settings for mode and CRC/checksum on the mistic I/O units. Make sure that mode 2 (command 904) is used with multifunction I/O units and mode 3 is used with local, simple I/O units.
-46	G4LC32 Buffer Overrun - From Host Computer	This error indicates that G4LC32 received more characters from the host than were expected. This may occur because of improper biasing of remote links combined with an electrically noisy environment. See recommendations described for a -42 error.
-47	Reserved	
-48	Bus Error Occurred in G4LC32	This error indicates that a BUS ERROR condition occurred in the mistic 200 controller. It is usually caused by a failure in the mistic 200 controller's hardware. The failure may be due to a bad memory or port device. The error flag can only be cleared by issuing a "Bus Error Clear" (7) command to the G4LC32. Remember to send this command in the binary mode, NOT in the PASS-THRU mode. This error is a warning that there is something wrong with the G4LC32, and clearing the bus error flag will not solve the problem. If it occurs, make sure that all the cards in the controller are properly seated.

Servo Motion Control Unit Errors

Table C-4. Servo Motion Control Unit Errors

Error	Name	Definition
-80	Invalid Command	This error indicates that the I/O unit did not recognize the command. Make sure that you are sending a Servo Motion Command to a Servo Motion I/O unit at the specified address. This may also occur if the servo Motion I/O unit's firmware is not current with this version of the driver. In this case contact Opto 22 for the latest update.
-81	Limit Switch Active Error	This error occurs when a "Start Motion" command (#810) is sent and a limit switch is currently active.
-82	Cannot Load Acceleration	This error occurs when a "Load Acceleration" command (#812) is sent and the axis is currently running. The acceleration can only be loaded when motion is stopped.
-83	Cannot Set Direction	This error occurs when a "Set Direction" command (#814, #815) is sent and the motion unit is configured for position mode. The "Set Direction" commands are only valid in velocity mode.
-84	Cannot Load Position	This error occurs when a "Load Position" command (#813) is sent and the motion unit is configured for velocity mode. The "Load Position" command is only valid in position relative or position absolute modes.
-85	Busy Executing Find Home Sequence	This error occurs when a command is sent that affects motion, and the motion unit is currently busy executing a "Find Home" command (#826, #827). You must wait until the "find home" sequence is complete before sending the command.
-86	Limit and Home Switches Disabled	This error occurs when a command is sent that depends on the limit or home switches and the switches are currently disabled. Remember to enable the switches and set their polarities before using them.

Continued on next page

Servo Motion Control Unit Errors, continued

Error	Name	Definition
-87	Trigger Buffer Enabled	This error occurs when a command is sent that involves the trigger buffer and the trigger buffer is currently enabled (in-use). Disable the trigger buffer first before trying to program it.
-88	Both Limit Switches True	This error occurs when a command is sent which may be affected by the limit switches, and both limit switches are indicating a true condition. If both switches indicate a true condition, they may indicate a mechanical failure or the polarity bits are not correct. Use the “Set Input Port Configuration MOMO” command (#802) to set or clear the polarity bits.
-89	Trigger Buffer Empty	This error occurs when you try to execute the trigger buffer with “Execute Trigger Buffer” command (#849) and the trigger buffer is empty.
-90	Cannot Execute Find Index While Axis Is Running	This error occurs if you try to execute the “Find Index” command while the axis is running. Make sure the profile is complete by using the “Read Axis Motion Status” command (#816)).
-91	Invalid Data	This error occurs when you issue a “Find Index” command *(#825) with the Encoder Lines/Rev data parameter (data[0]) set to zero.
-92	Busy Executing Find Index	This error occurs when a command is sent that affects motion, and the motion unit is currently busy executing a “Find Index” command (#825). You must wait until the “find index” sequence is complete before sending the command.
-93	Limit Switch True	This error occurs when a “Find Index” command (#825) is sent and one of the limit switches is active. Make sure the motion system is in a position where it will not trip a limit switch when you send a “Find Index” command.

Continued on next page

Servo Motion Control Unit Errors, continued

Error	Name	Definition
-94	Anticipation Time Breakpoint Warning	This warning occurs when an anticipation time breakpoint is set with a time which calculates to less than the time it takes to make (complete) the move. In this case, the Breakpoint trip will occur immediately at the start. Remember, Anticipation Time is calculated with respect to the end of the move or motion profile.
-95	Invalid Scale Factor Data	This error occurs if a “Load Scale Factor” (#823) command is sent with a data parameter that is zero or negative.
-96	Scale Factor Divide By zero Error	This error occurs if a divide by zero operation occurs when the motion unit is doing scale factor calculations.
-97	Anticipation Time Breakpoint Error	This command occurs when a “Load Anticipation Time Breakpoint” command (#845) is sent and the motion unit is currently in velocity mode.
-98	Find Home Sequence Active	This error occurs when a command is sent that interferes with a “find home” sequence which is currently running.
-160	Begin Trigger Buffer Command Error	This error occurs when a “Begin Trigger Buffer” (#840) command is sent and the motion unit is currently in trigger buffer storage mode. After a “Begin Trigger Buffer” command (#840), an “End Trigger Buffer” command (#842) must be sent before another “Begin Trigger Buffer” command can be sent.
-161	Trigger Buffer Full	This error occurs in trigger buffer storage mode, when a command is sent and the trigger buffer capacity of the motion unit is used up. The trigger buffer can hold up to 2000 commands.
-162	Trigger Buffer Command Error	This error occurs when a command that reads or returns status information is sent while the motion unit is in “trigger buffer storage” mode. Only commands that control motion and do not return values can be stored in the trigger buffer.

Continued on next page

Servo Motion Control Unit Errors, continued

Error	Name	Definition
-163	End Trigger Buffer Command Error	This error occurs when an “End Trigger buffer Storage” command (#42) is sent and the motion unit is not in “trigger buffer storage” mode.
-164	Trigger Buffer Delimiter Error	This error occurs when a “Set Trigger Buffer Delimiter” command (#841) is sent and the motion unit is not in “Trigger Buffer Storage” mode.

Additional Error Codes

Table C-5. Additional Error Codes

Error	Name	Definition
-100	Invalid Port Error	This error occurs when a handle number for a port is specified and that port has not been assigned a driver or adapter type.
-102	Initialize Error	This error occurs if the proper AC37 or AC39 adapter could not be found at the location specified in the ConfigureAC37 or ConfigureAC39 functions.
-104	Port Lock Error	This error occurs when a call to the sendMIO() function is made while another command is being processed. Windows® allows multiple applications to call the same DLL function. Since the DLL only has one set of global data he must protect himself by using a lock mechanism to make sure that commands get processed one application at a time. If you encounter this error, you might consider having all scanning controlled by one application, and all other applications communicate to the scanner.
-105	Driver Configuration Error	This error occurs when the SendMIO() function is called prior to configuring a port with the AssignPortDriver() and Configure functions.

Notes:

Appendix D

CE Mark Annex B Addendum

Contents This appendix contains the following topics:

Topic	See Page
Annex B Addendum	D-2

Annex B Addendum

Purpose

The following table gives information about the electrical equipment in the AvantGaard™ 676. It is supplied to the end user of the tool to show the design, correct application, and use of the electrical equipment in the tool.

Table D-1. Annex B Details

Description	Definition
Are there to be modifications as allowed for in this standard?	No
Ambient temperature range	41° F (5° C) 104° F (40° C) with 24 hour average < 95° F (35° C)
Acceptable humidity range	Relative Humidity- 30% - 95% Non-Condensing
Altitude	3281 Ft. (1000m) If over, contact SpeedFam-IPEC Field Service Representative
Environmental	Contact SpeedFam-IPEC Field Engineering
Radiation	N/A
Vibration, shock	Not available at this time
Special Installation and operation requirements	See Installation Manual
Anticipated voltage fluctuations (if more than ± 10%)	± 10%

Continued on next page

Annex B Addendum, continued

Description	Definition
Anticipated frequency fluctuations (not more than .99 to 1.01 of nominal frequency continuously) Specification of the short-term value (not more than .98 to 1.02 short-time)	± 1% ± 2%
Indicate possible future changes in electrical equipment that will require an increase in the electrical supply requirements	None identified at this time, contact SpeedFam-IPEC
Indicate for each source of electrical supply required: Nominal voltage (V) Number of phases Frequency	 208 AC 3 50/60 Hz
Type of power supply earthing:	TN (System with one point directly earthed, with a protective conductor (PE) connected to that point)

Continued on next page

Annex B Addendum, continued

Description	Definition
Is the electrical equipment to be connected to a neutral (N) supply conductor?	Yes
Does the user or the supplier provide the overcurrent protection of the supply conductors?	Supplier provided
Type and rating of overcurrent protective devices	IEC 947-2 / AIC 65,000
Supply disconnecting device	A disconnection of the neutral (N) conductor is not required. A link for the neutral (N) is not permissible.
Type of disconnecting device to be provided	IEC 947-3

Continued on next page

Annex B Addendum, continued

Description	Definition
Limit of the power “UP” to which 3 phase motors may be started directly across the incoming supply lines	30kW
May the number of motor overload devices on 3-phase motors be reduced to two?	NO
Where the machine is equipped, with local lighting	Highest permissible voltage is 110V If lighting circuit voltage is not obtained directly from the power supply, state preferred voltage 110V
Functional identification	IEC 417, ISO 7000
Inscriptions/Special Markings	Facility Connection Points
Mark of Certification	Yes: SEMI S2-93, LVD, MD, EMC On Electrical Equipment in English
Technical Documentation	English on Standard Bond Paper, Cleanroom Paper, and Electronic media in English

Continued on next page

Annex B Addendum, continued

Description	Definition
Size, location and purpose of ducts, open cable trays or cable supports to be provided by user	See Installation Guide
For which of the following classes of persons is access to the interior of enclosures required during normal operation of the equipment?	No persons allowed in enclosure during normal operation
Are locks with removable keys to be provided for fastening doors or covers?	Yes
If “two-handed control” is to be provided, state the type:	via keyboard
Where it is Type 3, state the time limit within which each pair of push-buttons shall be operated (0,2 s, 0,5 s, or 1 s)	N/A

Continued on next page

Annex B Addendum, continued

Description	Definition
In the case of machines with frequent repetitive cycles of operation dependent on manual control, how often is it expected that cycles of operation will be repeated?	N/A
For what length of time is it expected that this maximum rate of repetition will be repeated without subsequent pause?	N/A
In the case of specially built machines, is a certificate of operating type tests with the loaded machine to be supplied?	No
In the case of other machines, is a certificate of operating type tests on a loaded prototype machine to be supplied?	No

Notes:

Appendix E
Drawings

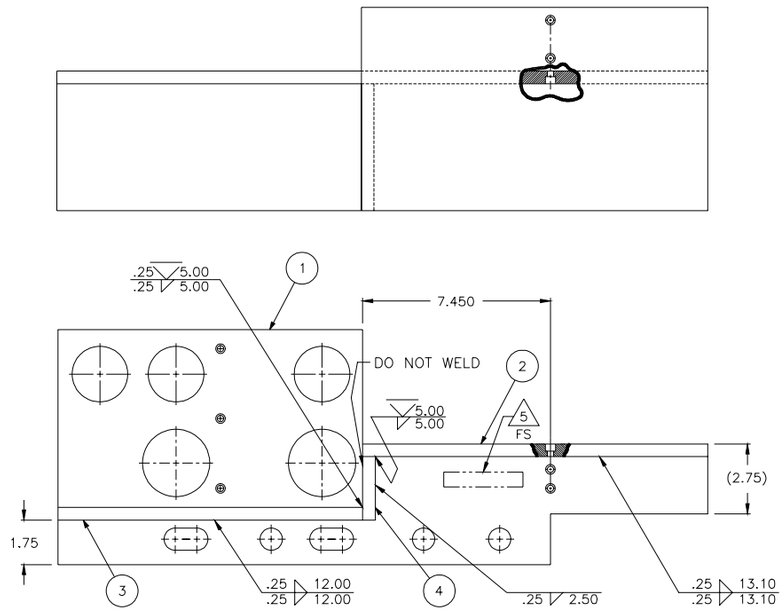
Contents This chapter contains the following schematics and drawings:

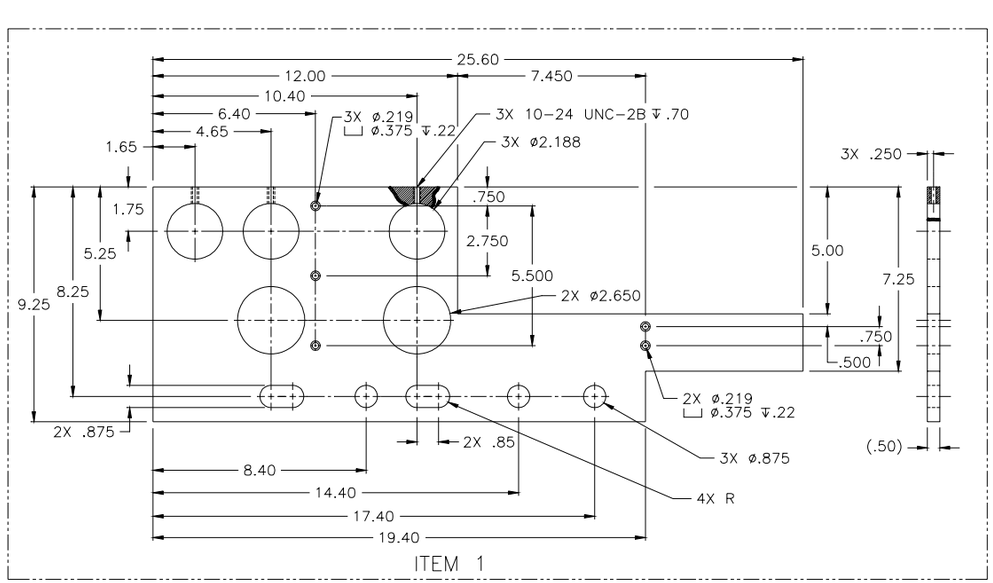
Name	Number	Page
Panel, Gauge, DI Plumbing	0350-727279	E-2
Plate, Electrical Cabinet Base	0810-718133	E-3
Facility, 676 Facility Layout, Hookups, and Maintenance Clearances 1 of 3	4325-719072	E-4
Schematic Tree	4605-728300	E-7
Schem, AC Power Distribution	4605-728301	E-8
Schematic, Power Distribution / E-Stop / Panel Interlock - CE	4605-728302	E-9
Schem, DC Power Cables 1 of 2	4605-728303	E-10
System Computer Interconnect Diagram	4605-728304	E-12
Schem, Comm Interconnect Diagram 1 of 2	4605-728305	E-13
Schem Cable Runs	4605-728320	E-15
M / P Upper Pneumatic Panel	4605-728346	E-16
M/P Lower Pneumatic Panel	4605-728347	E-17
Schem, C2C Upper Pneumatic Panel	4605-728348	E-18
C2C Lower Pneumatic Panel CE	4605-728349	E-19
Load Panel CE 1 of 2	4605-728356	E-20
Comm Interconnect Cables (Version U1) 1 of 2	4605-728357	E-22
Emergency Off Circuit	4605-728491	E-24

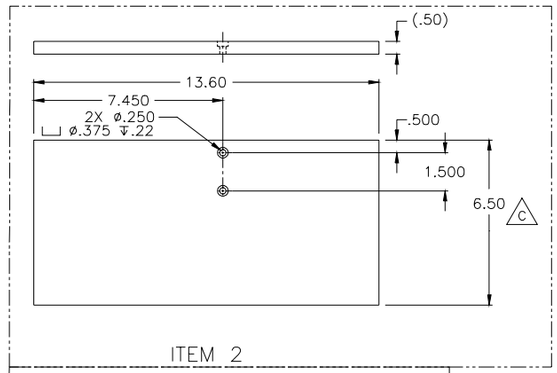
Panel, Gauge, DI Plumbing

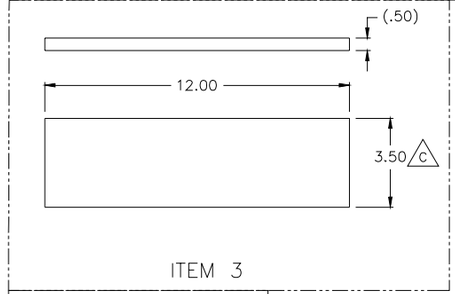
0350-727279

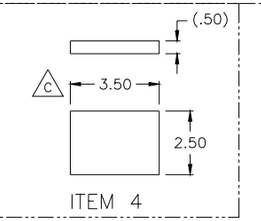
REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	IR	CJ	8/8/94	PORTLAND	8/8/94
B	06102	CLAY	3/2/98	A.B.	3/16/98
C	06478	CLAY	6/18/98		

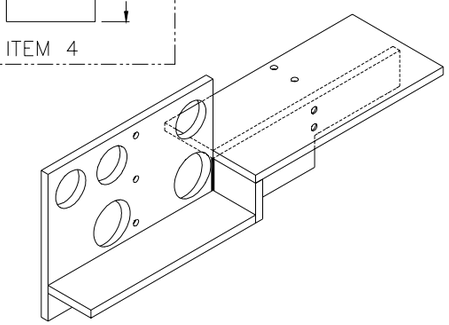












5. PART SHALL BE MARKED, USING PERMANENT INK STAMP, WITH MINIMUM LETTER HEIGHT OF .13, IN THE AREA DESIGNATED, WITH THE FOLLOWING INFORMATION: PART NUMBER, DASH NUMBER, (IF APPLICABLE), REVISION LETTER, DATE (YEAR, MONTH, DAY) OF MANUFACTURING SUPPLIER SYMBOL OR CODE.
4. WELDING ROD COLOR TO BE SAME AS ITEMS.
3. LEAVE PROTECTIVE PAPER ON TO PREVENT SCRATCHING WHEREVER POSSIBLE.
2. ALL SEAMS TO BE WELDED FULLY AS SHOWN, EXCEPT WHERE INDICATED.
1. MATL: WHITE POLYPROPYLENE .50 THK.

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

©1997 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M–1982 ☒ASME Y14.5M–1994

APPROVALS	DATE
DRAWN CJ	7/1/94
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

TITLE: PANEL,GAUGE DI PLUMBING

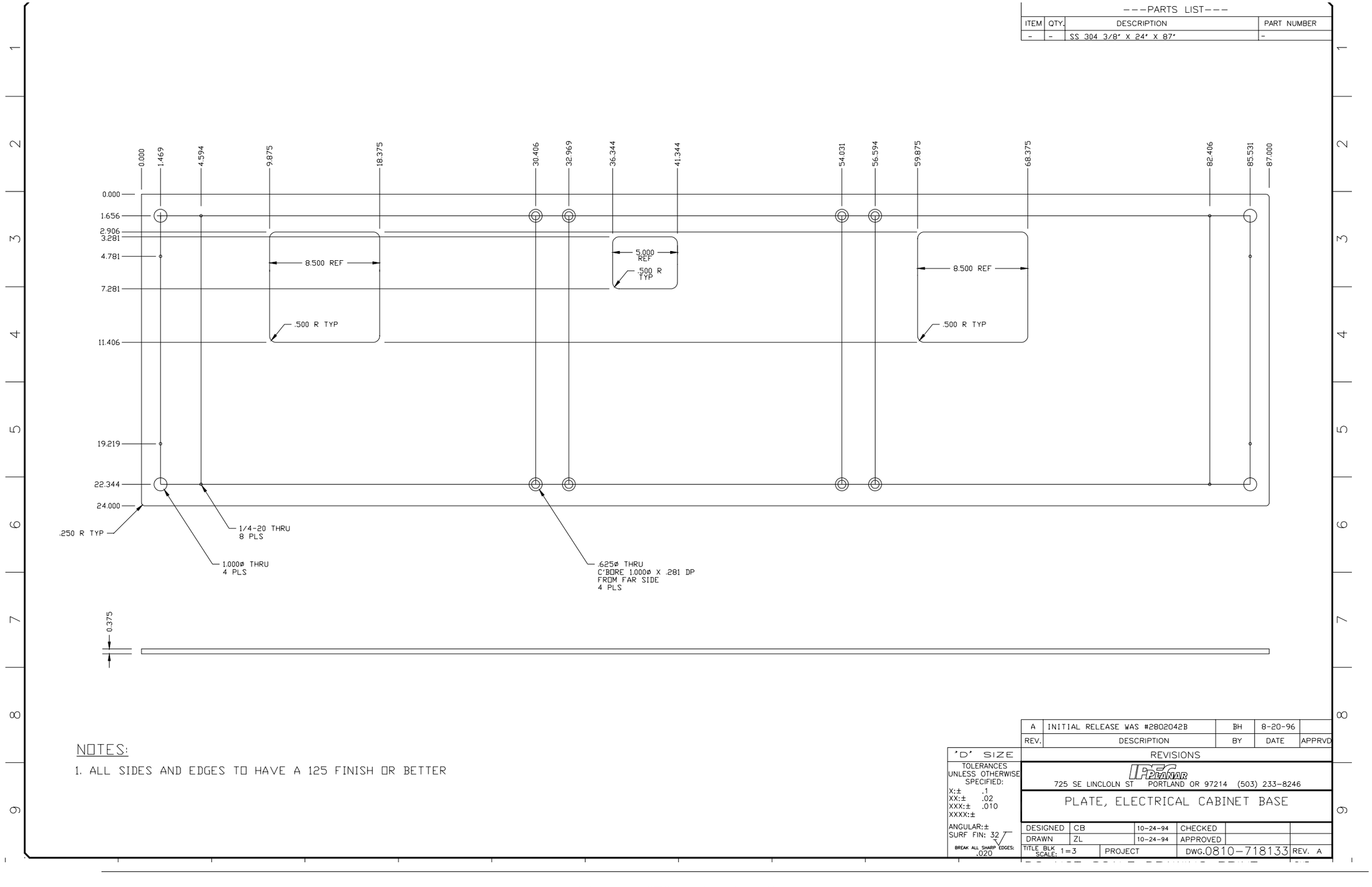
SIZE	FSCM NO.	DWG NO.	REV.
D		0350-727279	C

DO NOT SCALE DRAWING | SCALE 1/3 | SHEET 1 OF 1

Plate, Electrical Cabinet Base

SpeedFam-IPEC

0810-718133



NOTES:

1. ALL SIDES AND EDGES TO HAVE A 125 FINISH OR BETTER

REV.	DESCRIPTION	BY	DATE	APPRVD
A	INITIAL RELEASE WAS #2802042B	BH	8-20-96	

'D' SIZE

REVISIONS

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .010
XXXX:±
ANGULAR:±
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

IPEC PLANAR
725 SE LINCOLN ST PORTLAND OR 97214 (503) 233-8246

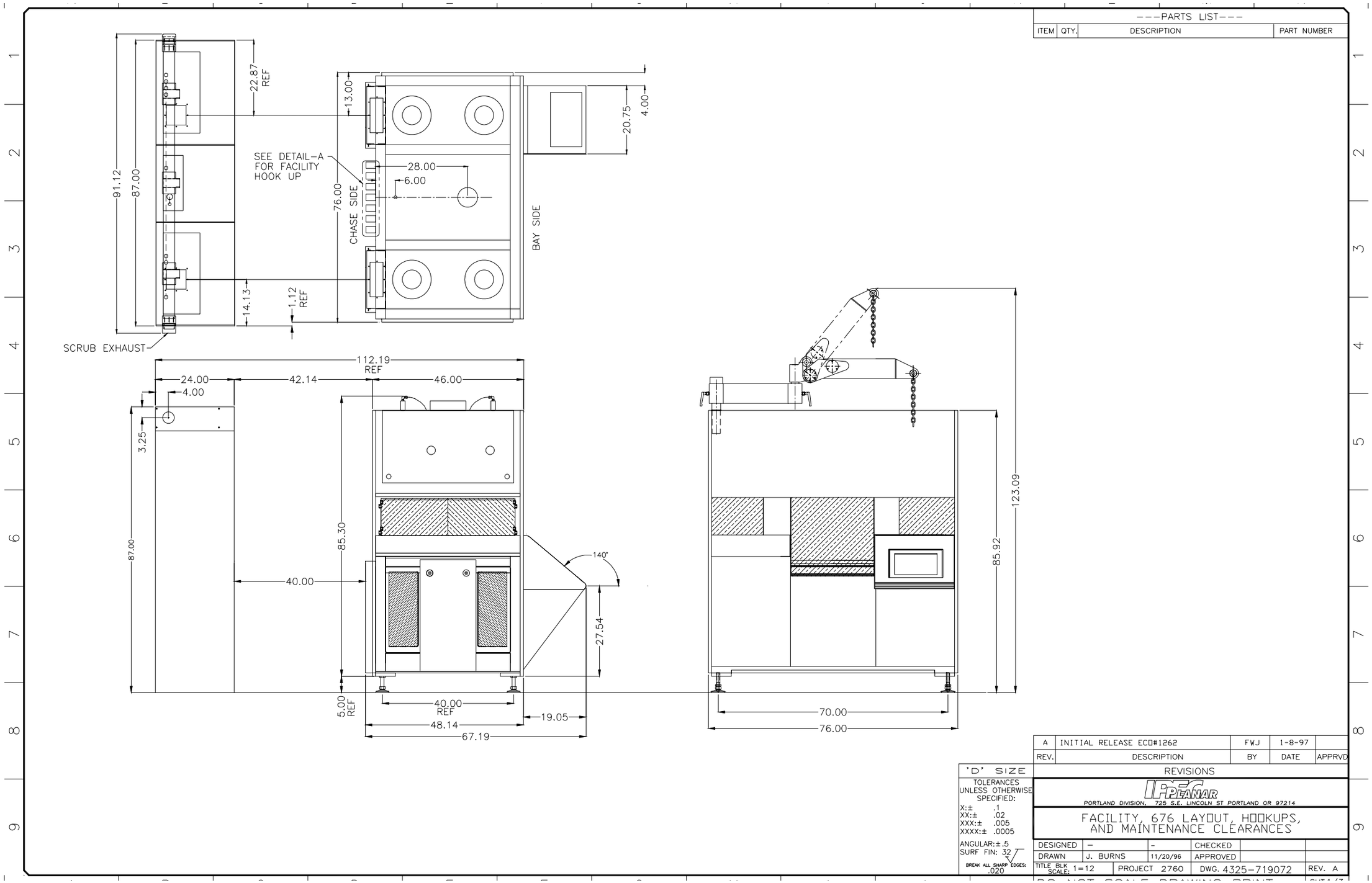
PLATE, ELECTRICAL CABINET BASE

DESIGNED	CB	10-24-94	CHECKED		
DRAWN	ZL	10-24-94	APPROVED		
TITLE BLK. 1=3 SCALE:	PROJECT		DWG.0810-718133	REV. A	

Facility, 676 Facility Layout, Hookups, and Maintenance Clearances 1 of 3

SpeedFam-IPEC

4325-719072



ITEM	QTY.	DESCRIPTION	PART NUMBER
---PARTS LIST---			

REV.	DESCRIPTION	BY	DATE	APPRVD
A	INITIAL RELEASE ECO#1262	FWJ	1-8-97	

'D' SIZE

REVISIONS

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:± .5
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

IPEC PLANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

FACILITY, 676 LAYOUT, HOOKUPS, AND MAINTENANCE CLEARANCES

DESIGNED	–	–	CHECKED	
DRAWN	J. BURNS	11/20/96	APPROVED	
TITLE BLK SCALE: 1=12	PROJECT 2760	DWG. 4325-719072		REV. A

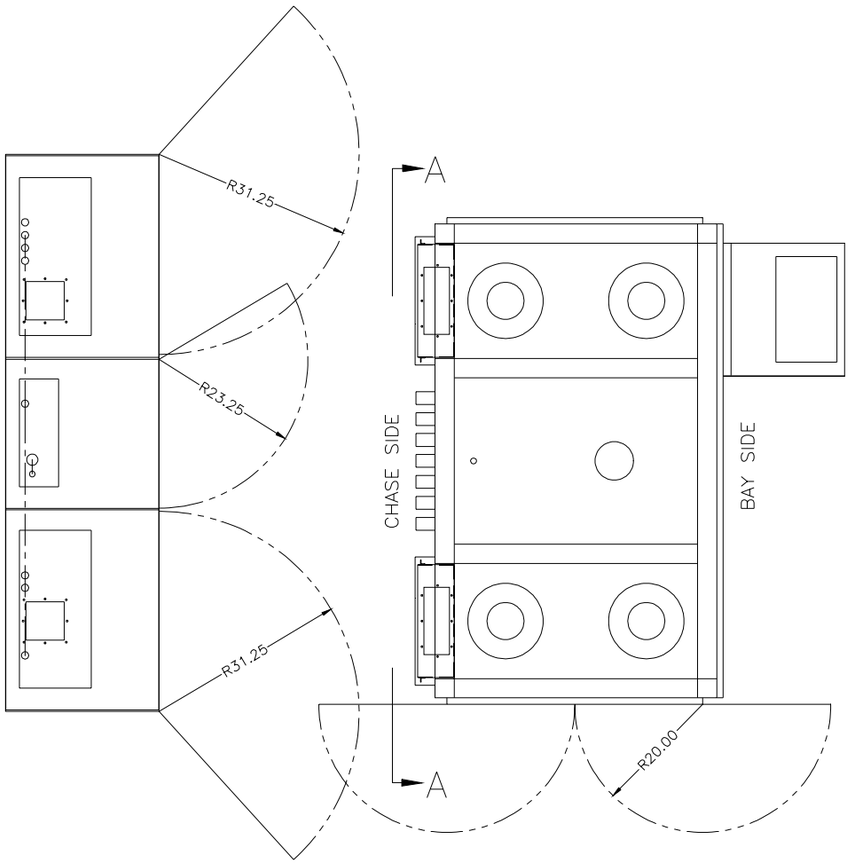
DO NOT SCALE DRAWING - PRINT

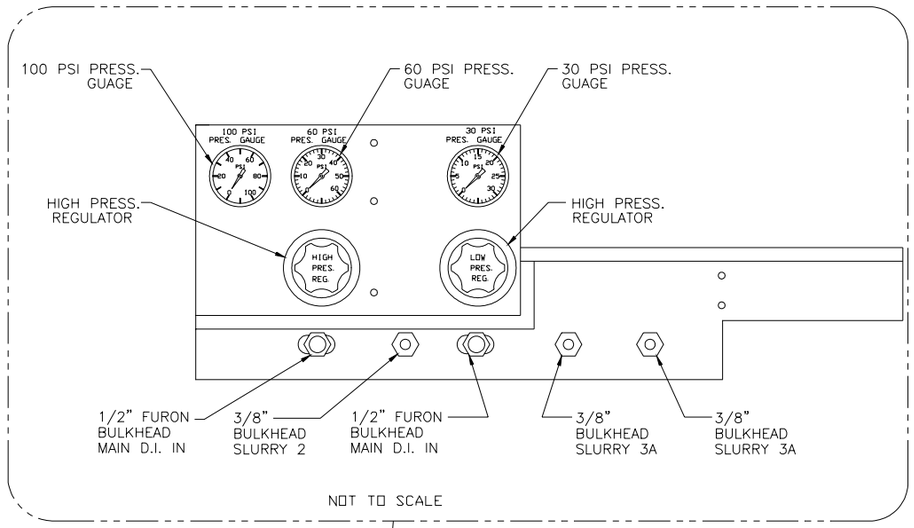
Facility, 676 Facility Layout, Hookups, and Maintenance Clearances 2 of 3

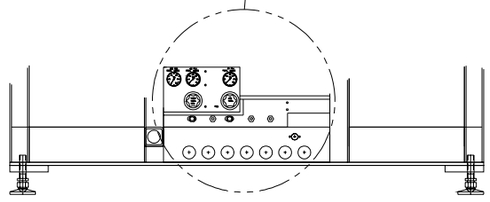
4325-719072

---PARTS LIST---

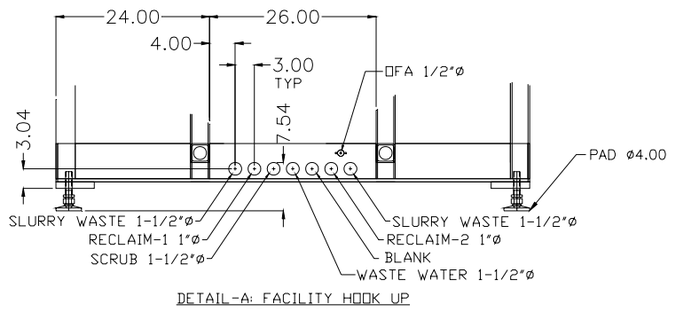
ITEM	QTY.	DESCRIPTION	PART NUMBER







VIEW A



DETAIL-A: FACILITY HOOK UP
NOT TO SCALE

REV.	DESCRIPTION	BY	DATE	APPRVD
A	INITIAL RELEASE ECO#1262	FWJ	1-8-97	

REVISIONS

'D' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.5
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

PLANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

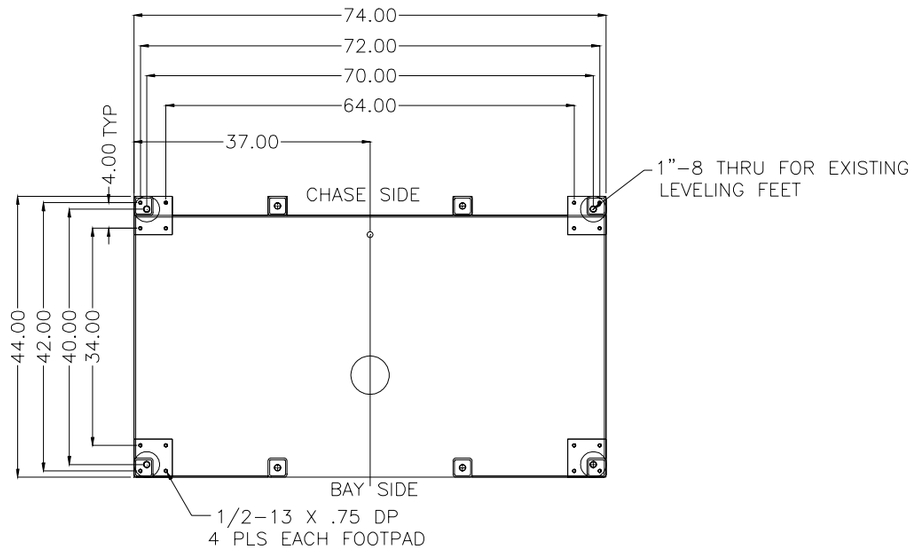
FACILITY, 676 LAYOUT, HOOKUPS, AND MAINTENANCE CLEARANCES

DESIGNED	–	–	CHECKED	
DRAWN	J. BURNS	11/20/96	APPROVED	
TITLE BLK SCALE: 1=10	PROJECT 2760		DWG. 4325-719072	REV. A

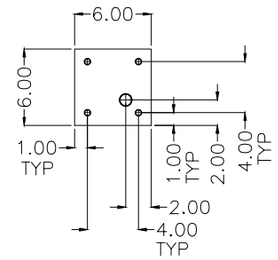
Facility, 676 Facility Layout, Hookups, and Maintenance Clearances 3 of 3

4325-719072

---PARTS LIST---			
ITEM	QTY.	DESCRIPTION	PART NUMBER



BOTTOM VIEW OF EXISTING FRAME



FOOTPAD DETAIL
SCALE 2:1

NOTES

1. WEIGHT 6500 LBS.
2. FOOT LOADING 25% ±5%.
3. CENTER OF GRAVITY OF TOOL CENTER LINE X-Y.
4. Z = 47.5 ±10% FROM BOTTOM OF FRAME.

REV.	DESCRIPTION	BY	DATE	APPRVD
A	INITIAL RELEASE ECO#1262	FWJ	1-8-97	

REVISIONS

'D' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.5
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

IPEANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

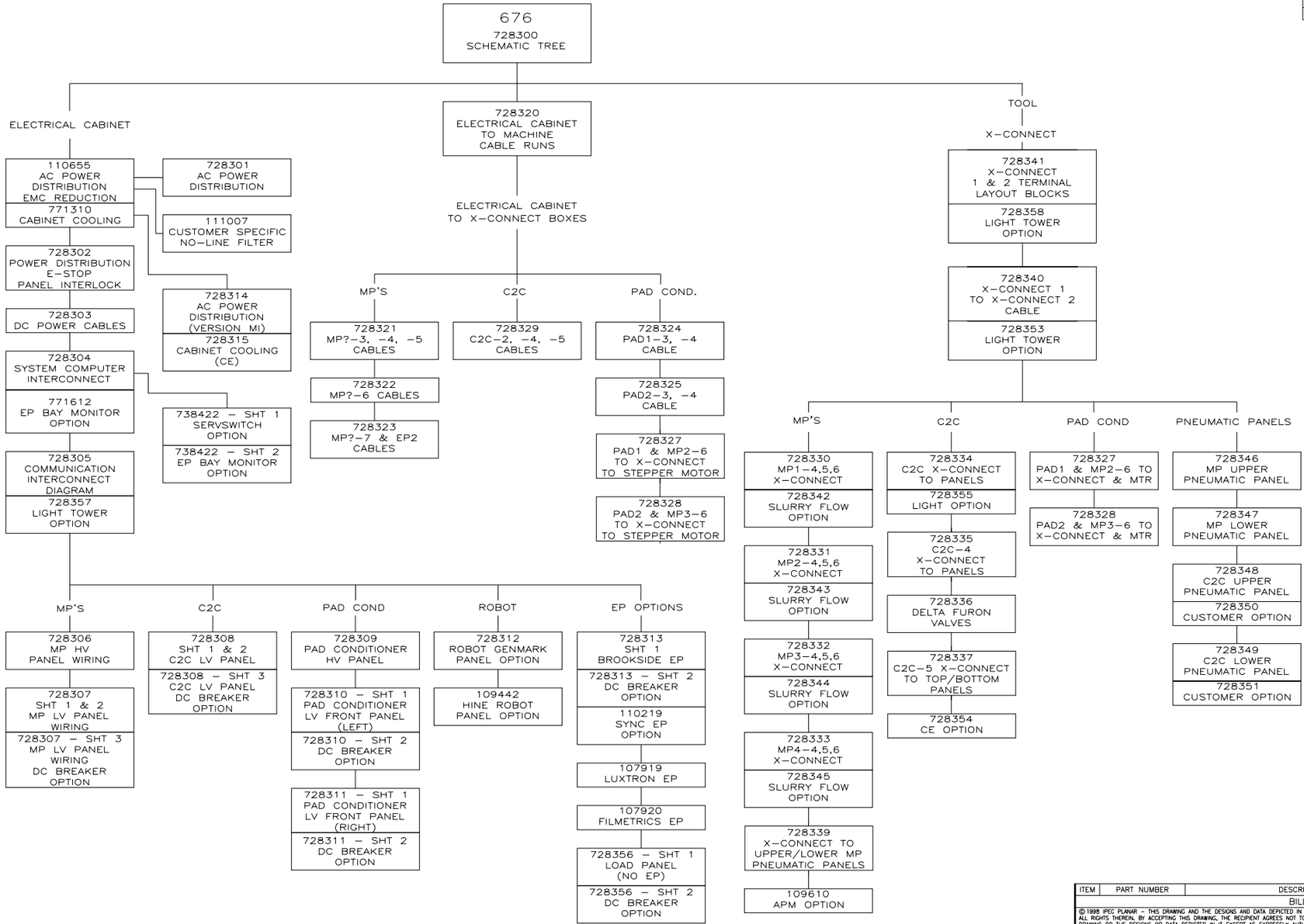
FACILITY, 676 LAYOUT, HOOKUPS, AND MAINTENANCE CLEARANCES

DESIGNED	-	-	CHECKED	
DRAWN	J. BURNS	11/20/96	APPROVED	
TITLE BLK SCALE: 1=10	PROJECT 2760	DWG. 4325-719072	REV. A	

Schematic Tree

4605-728300

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	–	C.L.	7/16/96	–	–
B	–	C.L.	2/27/96	–	–
C	1307	C.L.	3/5/97	–	–
D	10143	HCH	2/1/99		



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

© 1998 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ ANSI Y14.5M–1982 ☒ ASME Y14.5M–1994

APPROVALS	DATE
DRAWN C.L.	7/16/96
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

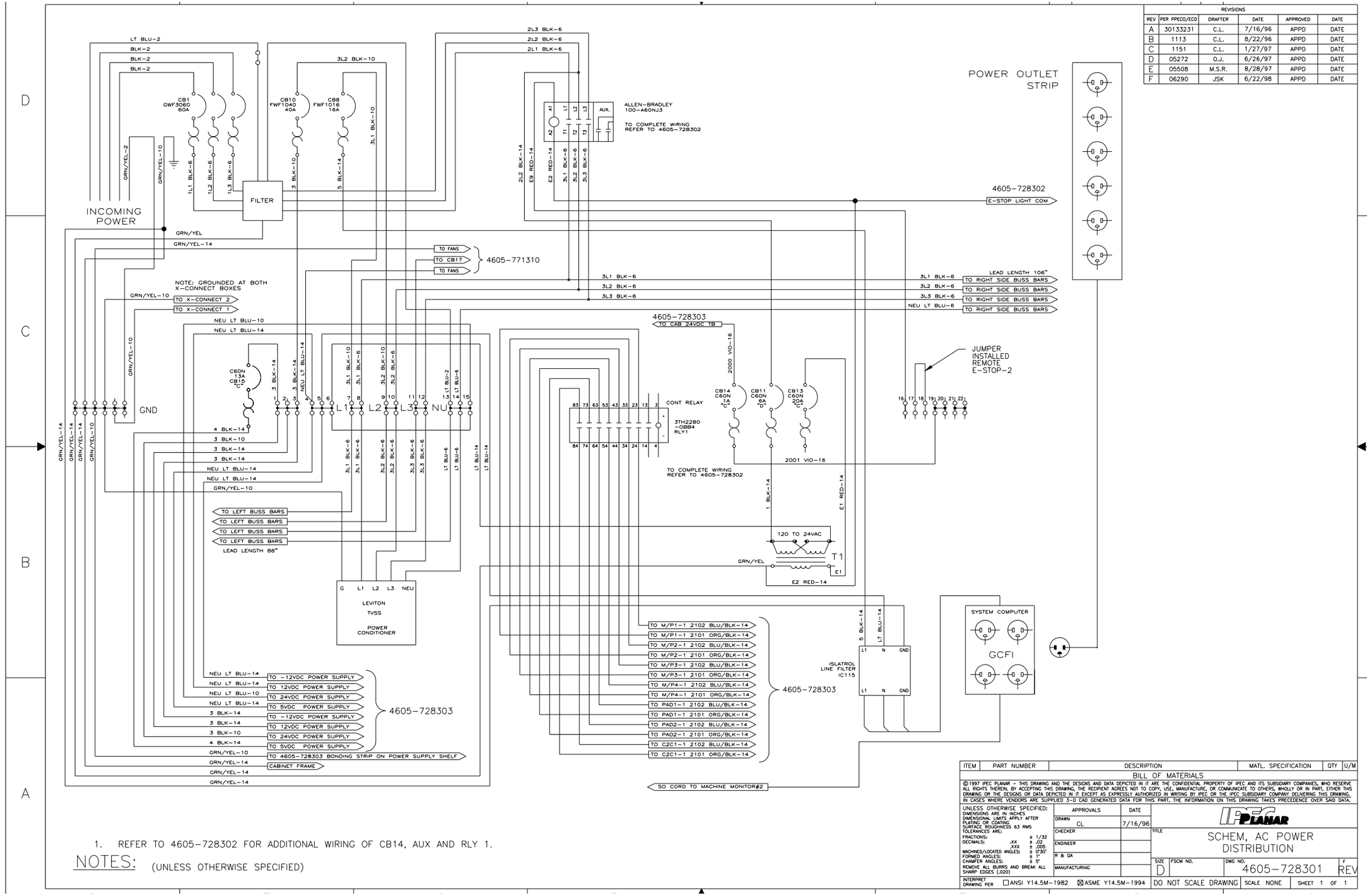
TITLE: SCHEM,676 TREE

SIZE	FSCM NO.	DWG NO.	REV.
B		4605–728300	D

DO NOT SCALE DRAWING | SCALE 1/1 | SHEET 1 OF 1

Schem, AC Power Distribution

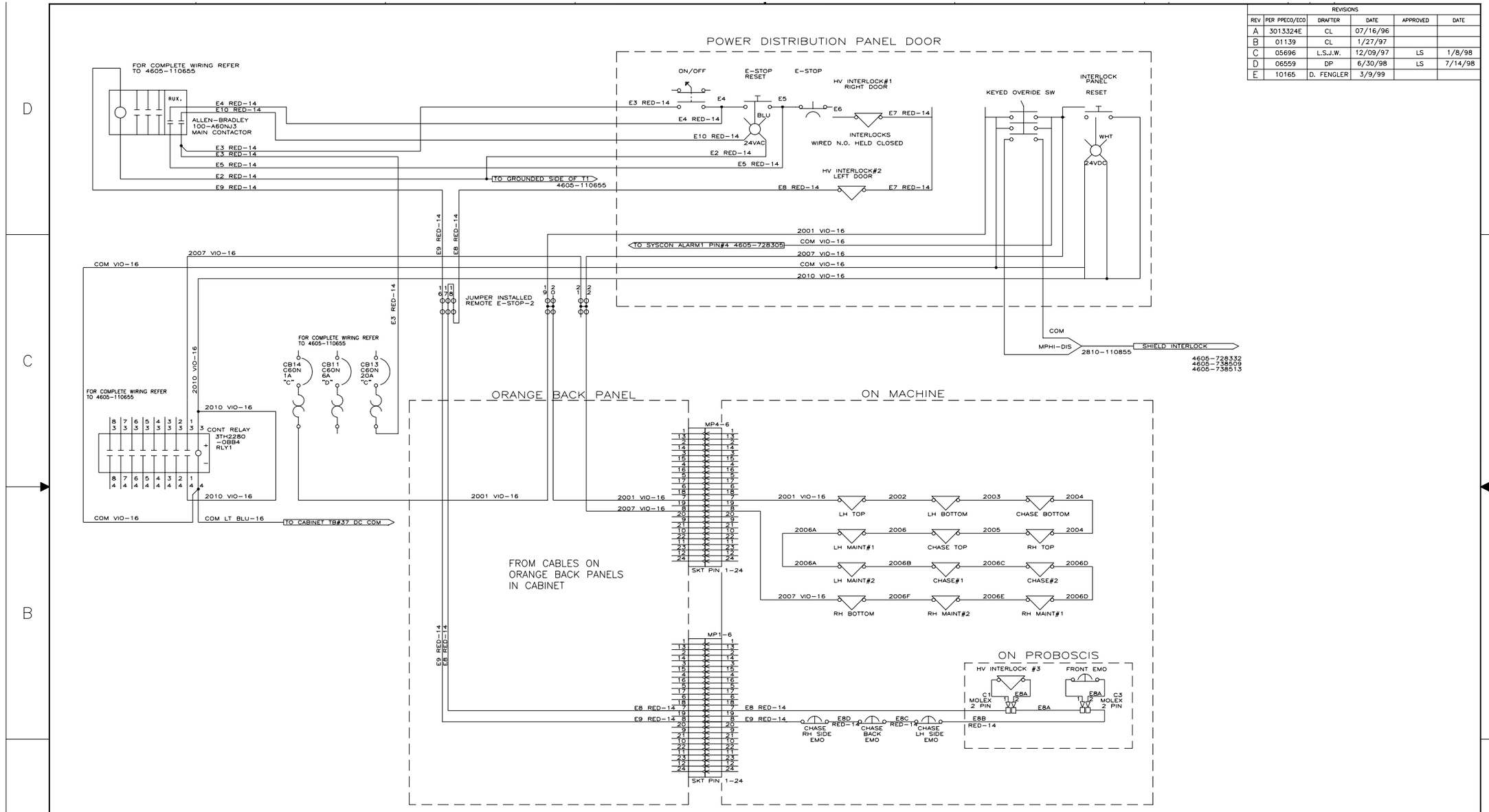
4605-728301


REVISIONS
REV | PER PPECO/ECO | DRAFTER | DATE | APPROVED | DATE
A | 30133231 | C.L. | 7/16/96 | APPD | DATE
B | 1113 | C.L. | 8/22/96 | APPD | DATE
C | 1151 | C.L. | 1/27/97 | APPD | DATE
D | 05272 | O.J. | 6/26/97 | APPD | DATE
E | 05508 | M.S.R. | 8/28/97 | APPD | DATE
F | 06290 | JSK | 6/22/98 | APPD | DATE
INCOMING POWER
FILTER
CB1 GWF3060 60A
CB10 FWF1040 40A
CB8 FWF1016 16A
ALLEN-BRADLEY 100-A60NJ3
TO COMPLETE WIRING REFER TO 4605-728302
POWER OUTLET STRIP
4605-728302
E-STOP LIGHT COM
4605-771310
TO FANS
TO CB17
NOTE: GROUNDED AT BOTH X-CONNECT BOXES
TO X-CONNECT 2
TO X-CONNECT 1
LEAD LENGTH 106"
TO RIGHT SIDE BUSS BARS
4605-728303
TO CAB 24VDC TB
JUMPER INSTALLED REMOTE E-STOP-2
CONT RELAY
3TH2280 -0BB4 RLY1
2000 VIO-16
2001 VIO-16
TO COMPLETE WIRING REFER TO 4605-728302
120 TO 24VAC
T1
TO LEFT BUSS BARS
LEAD LENGTH 88"
LEVITON TVSS POWER CONDITIONER
SYSTEM COMPUTER
GCFI
ISLATROL LINE FILTER IC115
TO M/P1-1 2102 BLU/BLK-14
TO M/P1-1 2101 ORG/BLK-14
TO M/P2-1 2102 BLU/BLK-14
TO M/P2-1 2101 ORG/BLK-14
TO M/P3-1 2102 BLU/BLK-14
TO M/P3-1 2101 ORG/BLK-14
TO M/P4-1 2102 BLU/BLK-14
TO M/P4-1 2101 ORG/BLK-14
TO PAD1-1 2102 BLU/BLK-14
TO PAD1-1 2101 ORG/BLK-14
TO PAD2-1 2102 BLU/BLK-14
TO PAD2-1 2101 ORG/BLK-14
TO C2C1-1 2102 BLU/BLK-14
TO C2C1-1 2101 ORG/BLK-14
4605-728303
SO CORD TO MACHINE MONITOR#2
TO -12VDC POWER SUPPLY
TO 12VDC POWER SUPPLY
TO 24VDC POWER SUPPLY
TO 5VDC POWER SUPPLY
TO 4605-728303 BONDING STRIP ON POWER SUPPLY SHELF
CABINET FRAME
1. REFER TO 4605-728302 FOR ADDITIONAL WIRING OF CB14, AUX AND RLY 1.
NOTES: (UNLESS OTHERWISE SPECIFIED)
ITEM | PART NUMBER | DESCRIPTION | MATL. SPECIFICATION | QTY | U/M
BILL OF MATERIALS
© 1997 IPEC PLANAR - THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M-1982 ☒ASME Y14.5M-1994
APPROVALS | DATE
DRAWN CL 7/16/96
CHECKER
ENGINEER
R & QA
MANUFACTURING
IPEC PLANAR
TITLE: SCHEM, AC POWER DISTRIBUTION
SIZE D | FSCM NO. | DWG NO. 4605-728301 | F REV
DO NOT SCALE DRAWING | SCALE NONE | SHEET 1 OF 1

Schematic, Power Distribution / E-Stop / Panel Interlock - CE

4605-728302

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	3013324E	CL	07/16/96		
B	01139	CL	1/27/97		
C	05696	L.S.J.W.	12/09/97	LS	1/8/98
D	06559	DP	6/30/98	LS	7/14/98
E	10165	D. FENGLER	3/9/99		



3. DC COMMON WIRES MAY BE LT BLU OR WHT/BLU (PER NFPA 79).
2. REFER TO 4605-728322 FOR ADDITIONAL WIRING TO MP1-6 AND MP4-6.
1. REFER TO 4605-728301 FOR ADDITIONAL WIRING OF CB14, AUX AND RLY1.

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

© 1998 IPEC PLANAR - THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M-1982 ☒ASME Y14.5M-1994

APPROVALS	DATE
DRAWN CL	7/16/96
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

TITLE: SCHEMATIC, POWER DISTIBRUTION/ E-STOP/PANEL INTERLOCK-CE

SIZE B | FSCM NO. | DWG NO. 4605-728302 | REV. E

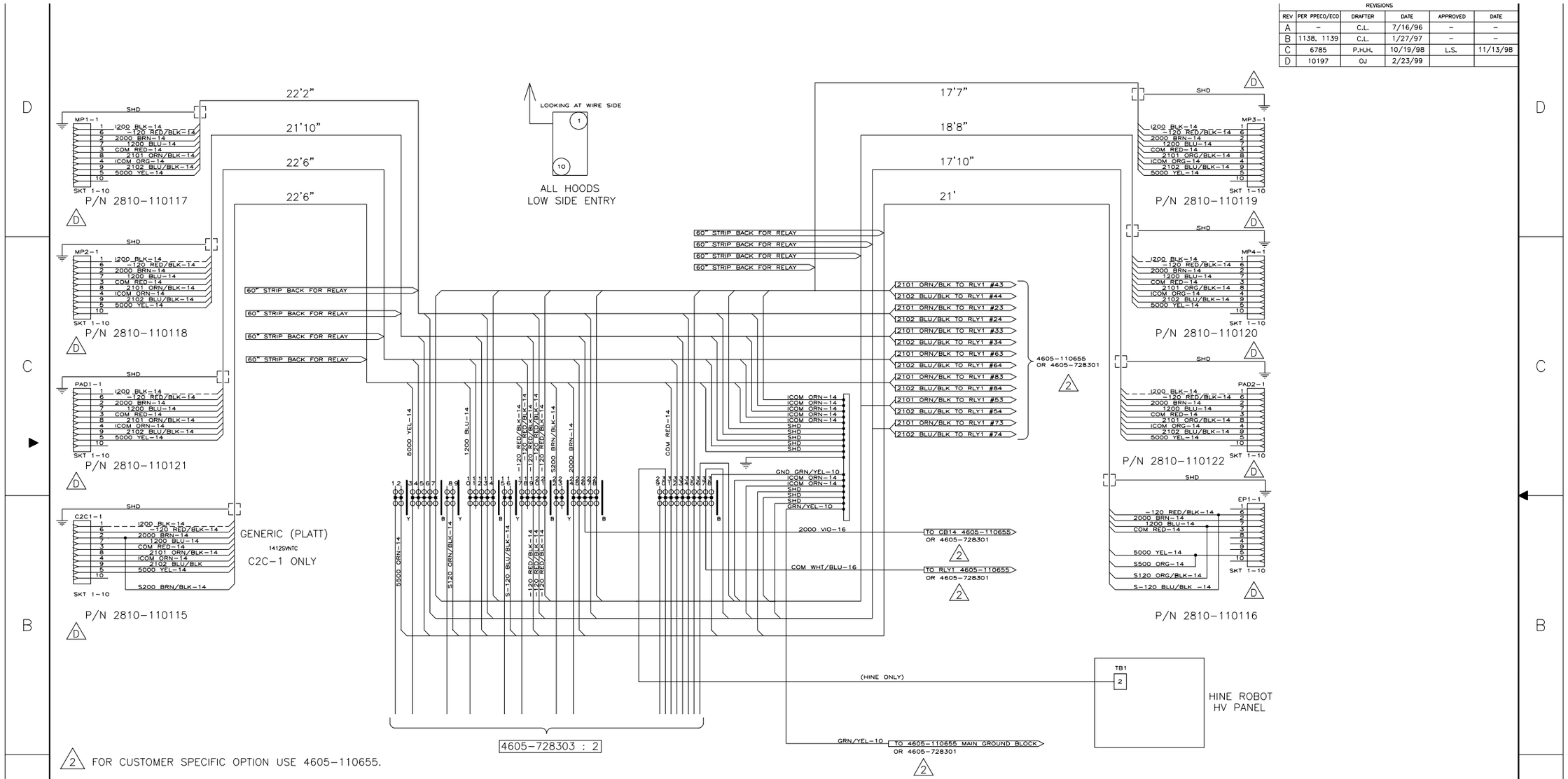
DO NOT SCALE DRAWING | SCALE NONE | SHEET 1 OF 1

Schem, DC Power Cables 1 of 2

SpeedFam-IPEC

4605-728303

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	–	C.L.	7/16/96	–	–
B	1138, 1139	C.L.	1/27/97	–	–
C	6785	P.H.H.	10/19/98	L.S.	11/13/98
D	10197	OJ	2/23/99		



2 FOR CUSTOMER SPECIFIC OPTION USE 4605-110655.

1 FOR PREVIOUS TYPE POWER SUPPLY SEE SHEET 2.
24VDC = 2000-#10 AWG
24+SENS = S200-#14 AWG
12VDC = 1200-#14 AWG
12+SENS = S120-#14AWG
-12VDC = -120-#14 AWG
-12+SENS = S-120-#14 AWG
5VDC = 5000-#10 AWG
5+SENS = S500-#14 AWG
+ VOLTAGE = DARK BLU
COM = WHT/BLU
-12V SUPPLY IS CREATED BY INVERTING AN ISOLATED 12V SUPPLY. THE V+ OUTPUT IS TIED TO COMMON. THE V- OUTPUT IS THE -12V.
NO FERRULES ON 10AWG

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

©1998 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M-1982 ☒ASME Y14.5M-1994

APPROVALS	DATE
DRAWN C.L.	7/16/96
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

TITLE: SCHEM, DC POWER CABLE

SIZE	FSCM NO.	DWG NO.	REV.
B		4605-728303	D

DO NOT SCALE DRAWING | SCALE 1/2 | SHEET 1 OF 2

Schem, DC Power Cables 2 of 2

4605-728303

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
SEE SHEET 1 FOR REVISIONS					

NOTE:
SPECIAL SETUP FOR
−12VDC POWER SUPPLY

P/N 2810−110115

△D

NEU LT BLU−14 (WHT)
BLK−14
0V
110V
−12VDC
O N AC
O L
FG
+O
−O
LAMBRA
RWS 30A−12

COM WHT/BLU−14
COM WHT/BLU−14 (+SENSE)
−120 BLU−14
S−120BLU−14 (−SENSE)

NEU LT BLU−14 (WHT)
BLK−14
0V
110V
+12VDC
O N AC
O L
FG
VO+O
VO−O
MELCHER
VEW 25−12

△D △1

1200 BLU−14
S120 BLU−14 (+SENSE)
COM WHT/BLU−14
COM WHT/BLU−14 (−SENSE)

NEU LT BLU−14 (WHT)
4 BLK−14
0V
110V
+5VDC
O N AC
O L
FG
+VO
−VO
+SO
−SO
MELCHER
VRW 200−05

5000 BLU−10
COM WHT/BLU−14
S500 BLU−14
COM WHT/BLU−14

CHASSIS GRD
YELL/GRN−10AWG
NEU LT BLU−10 (WHT)
3 BLK−10
+24VDC
AC
O 1
O 2 N
O 3 L
+VO
−VO
OMEGA
MG3−1F−1F−PS1105

2000 BLU−10
S200 BLU−14 (+SENSE)
COM WHT/BLU−14
COM WHT/BLU−14 (−SENSE)

NEW STYLE POWER SUPPLY

NOTE:
SPECIAL SETUP FOR
−12VDC POWER SUPPLY

−12VDC
0V
110V
220V
AC
FG
+OUT
−OUT
+SENS
−SENS
+R
−R
LAMBRA
LFS 39−12

COM WHT/BLU−14
−120 BLU−14
COM WHT/BLU−14
S−120BLU−14

+12VDC
LAMBRA
LFS 40−12

1200 BLU−14
COM WHT/BLU−14
S120 BLU−14
COM WHT/BLU−14

+5VDC
LAMBRA
LFS 43−5

5000 BLU−10
COM WHT/BLU−14
S500 BLU−14
COM WHT/BLU−14

+24VDC
LAMBRA
LFS 48−24

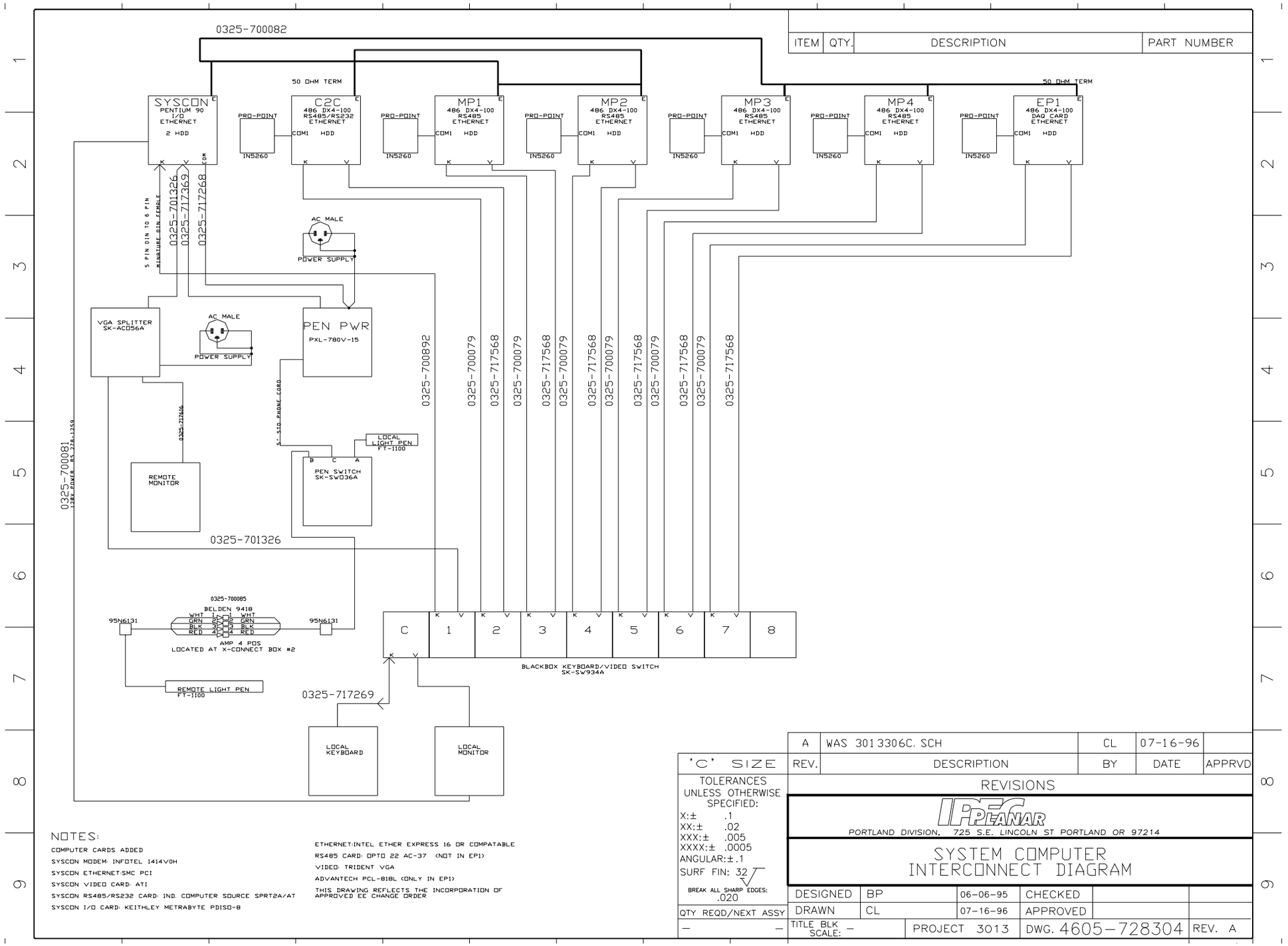
2000 BLU−10
COM WHT/BLU−14
S200 BLU−14
COM WHT/BLU−14

OLD STYLE POWER SUPPLY

TITLE			
SCHEM, DC POWER CABLES			
SIZE B	FSCM NO.	DWG NO. 4605−728303	REV. D
DO NOT SCALE DRAWING	SCALE 1/2	SHEET 2 OF 2	

System Computer Interconnect Diagram

4605-728304



NOTES:

COMPUTER CARDS ADDED
SYSCON MODEM: INFOTEL 1414V0H
SYSCON ETHERNET:SMC PCI
SYSCON VIDEO CARD: ATI
SYSCON RS485/RS232 CARD: IND. COMPUTER SOURCE SPRT2A/AT
SYSCON I/O CARD: KEITHLEY METRABYTE PDISO-8

ETHERNET:INTEL ETHER EXPRESS 16 OR COMPATABLE
RS485 CARD: OPTO 22 AC-37 (NOT IN EP1)
VIDEO: TRIDENT VGA
ADVANTECH PCL-818L (ONLY IN EP1)

THIS DRAWING REFLECTS THE INCORPORATION OF APPROVED EE CHANGE ORDER

REV.	DESCRIPTION	BY	DATE	APPRVD
A	WAS 3013306C.SCH	CL	07-16-96	

'C' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.1
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

REVISIONS

PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

SYSTEM COMPUTER INTERCONNECT DIAGRAM

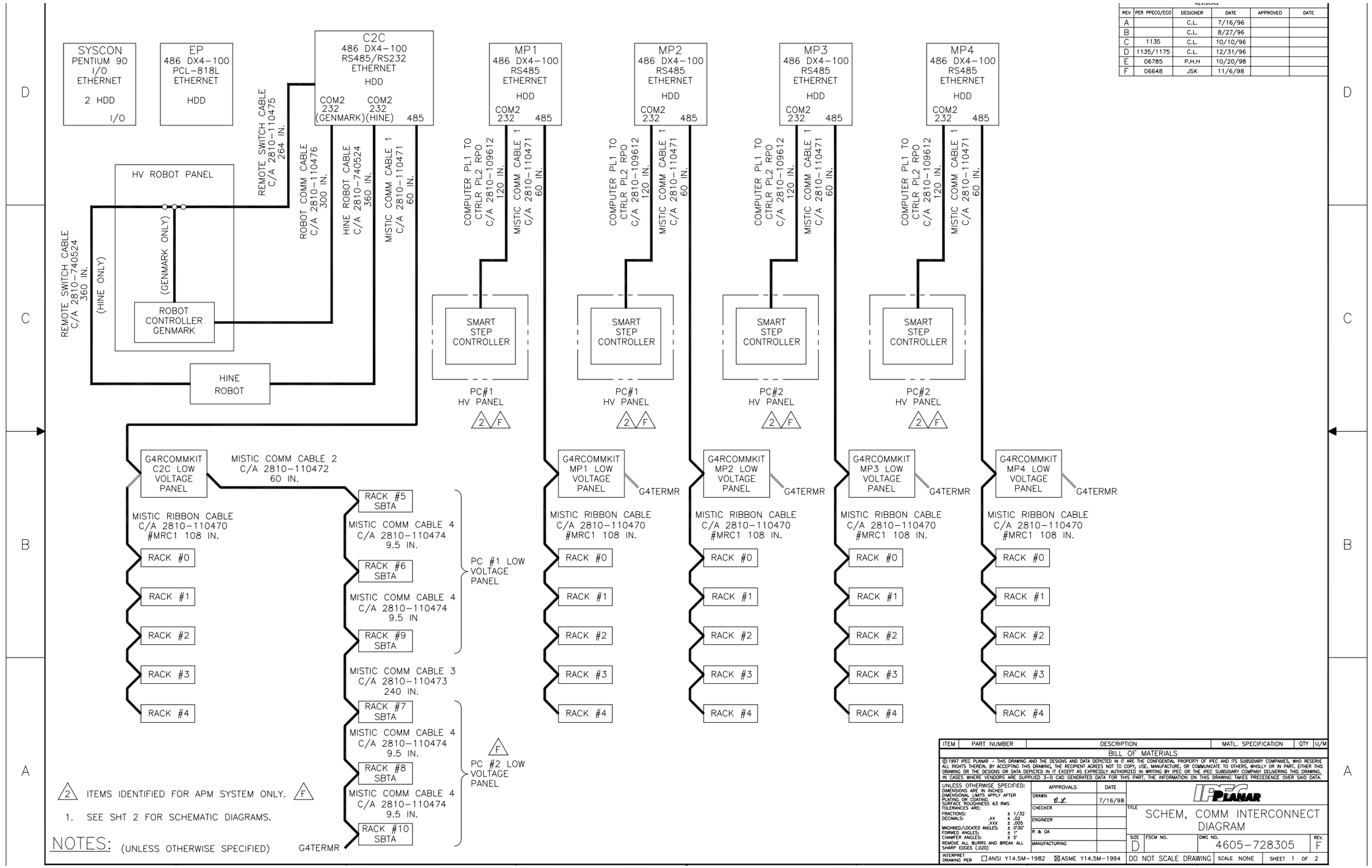
DESIGNED	BP	06-06-95	CHECKED		
DRAWN	CL	07-16-96	APPROVED		
QTY REQD/NEXT ASSY					
–	–	TITLE BLK SCALE: –	PROJECT 3013	DWG. 4605-728304	REV. A

Schem, Comm Interconnect Diagram 1 of 2

SpeedFam-IPEC

4605-728305

REV	PER PPECO/ECO	DESIGNER	DATE	APPROVED	DATE
A		C.L.	7/16/96		
B		C.L.	8/27/96		
C	1135	C.L.	10/10/96		
D	1135/1175	C.L.	12/31/96		
E	06785	P.H.H	10/20/98		
F	06648	JSK	11/6/98		



ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

© 1997 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0.30°
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M–1982 ☒ASME Y14.5M–1994

APPROVALS	DATE
DRAWN C.L.	7/16/98
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

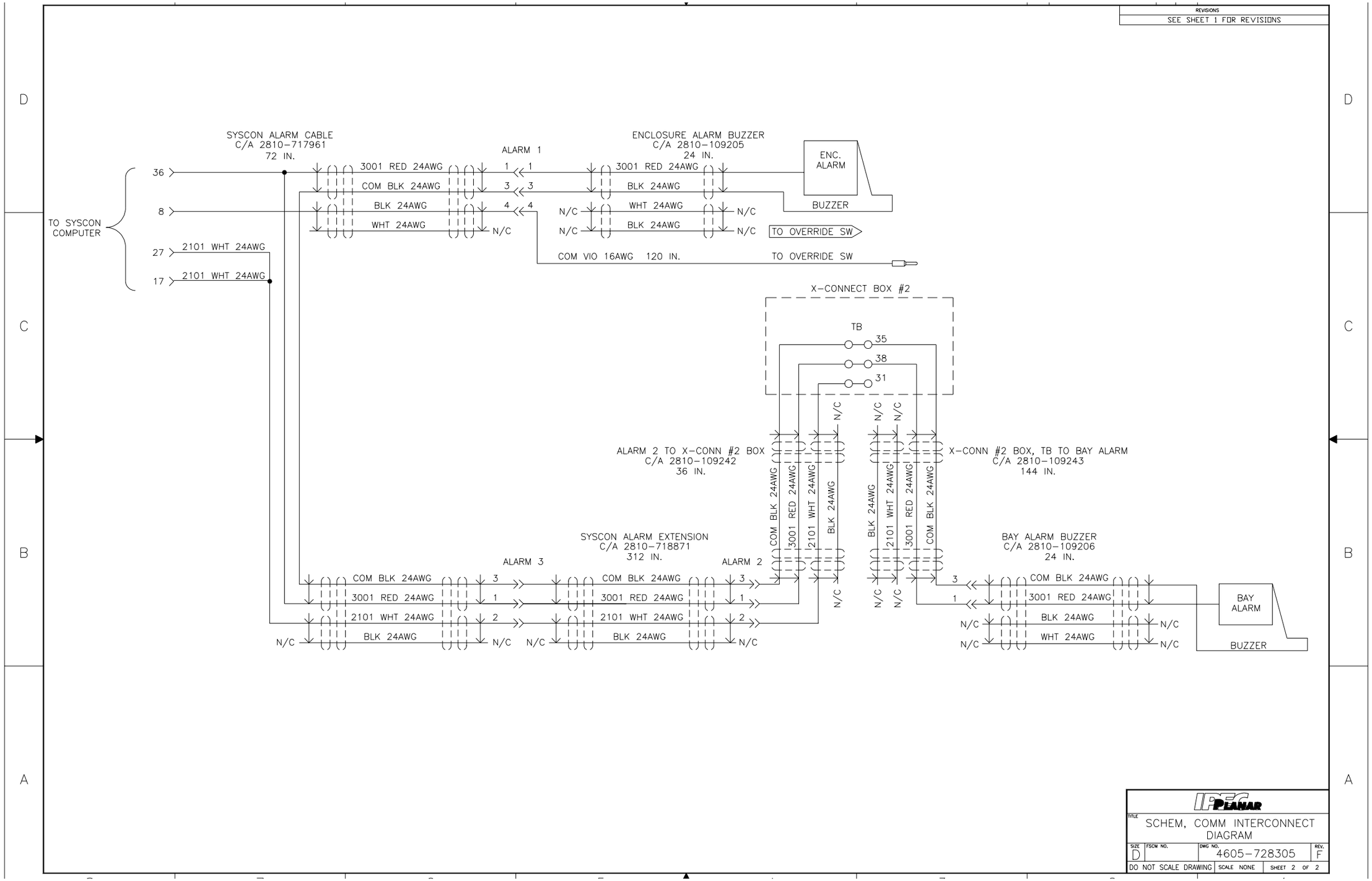
TITLE: SCHEM, COMM INTERCONNECT DIAGRAM

SIZE D | FSCM NO. | DWG NO. 4605-728305 | REV. F

DO NOT SCALE DRAWING | SCALE NONE | SHEET 1 OF 2

Schem, Comm Interconnect Diagram 2 of 2

4605-728305

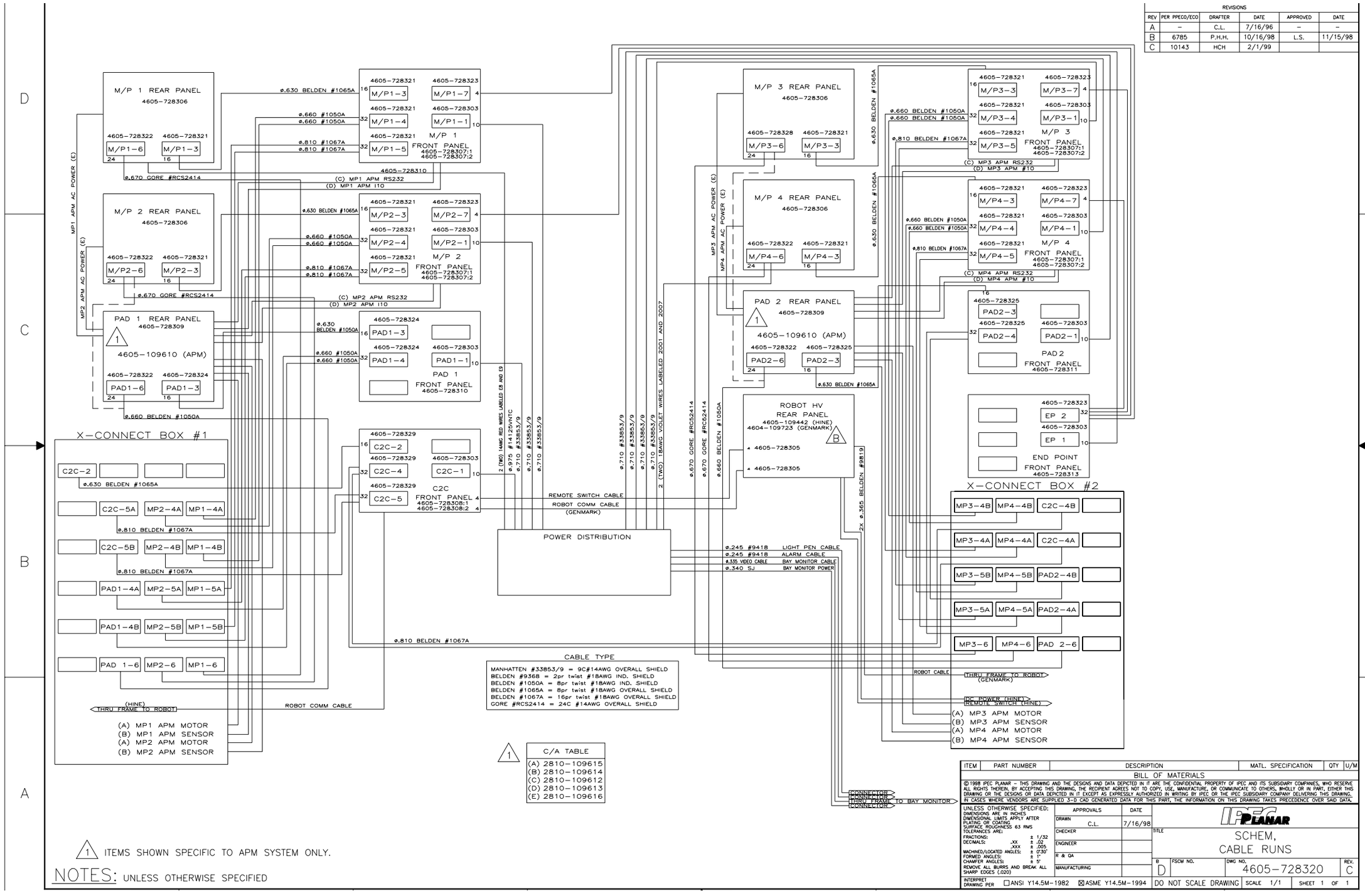


Schem Cable Runs

SpeedFam-IPEC

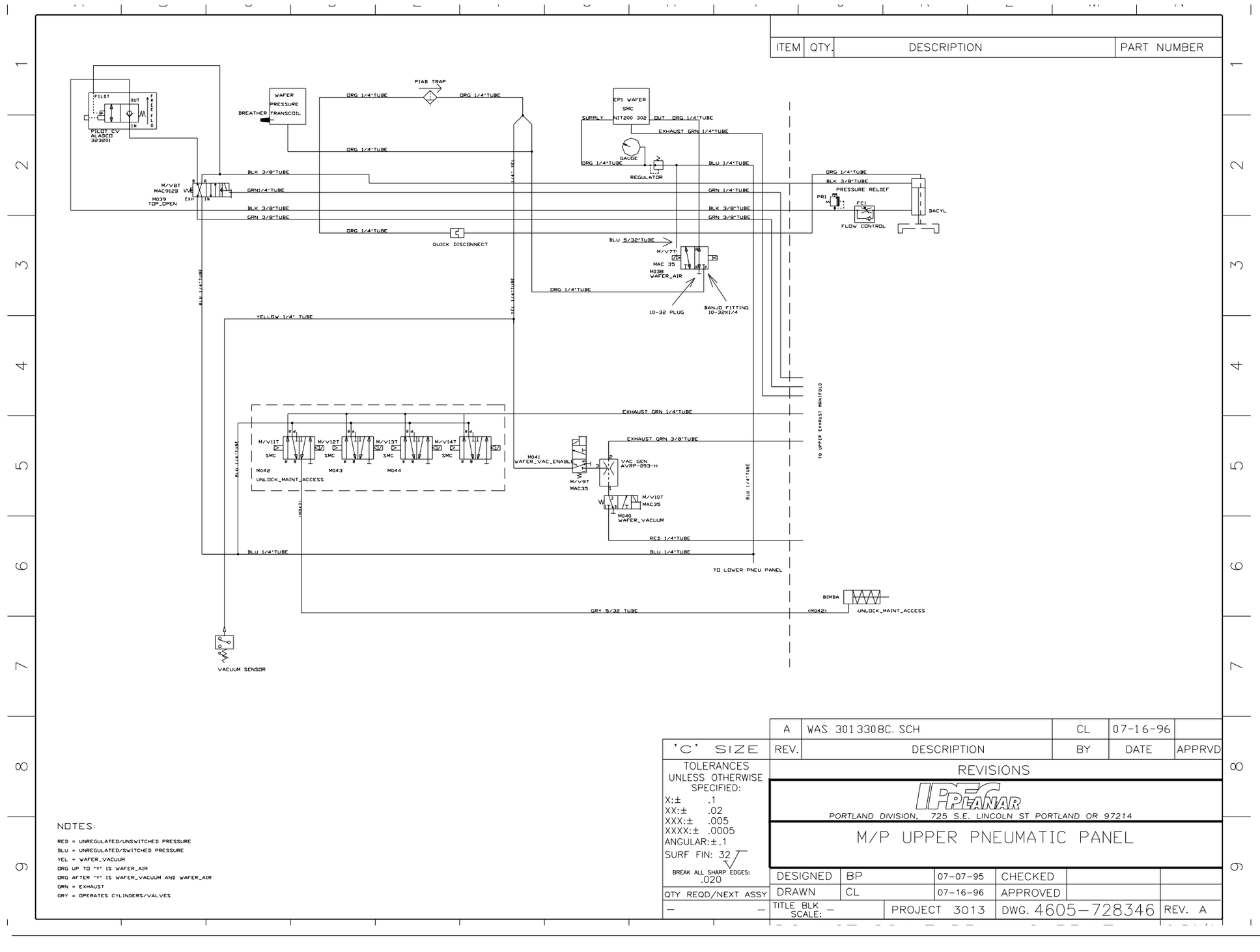
4605-728320

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	–	C.L.	7/16/96	–	–
B	6785	P.H.H.	10/16/98	L.S.	11/15/98
C	10143	HCH	2/1/99		



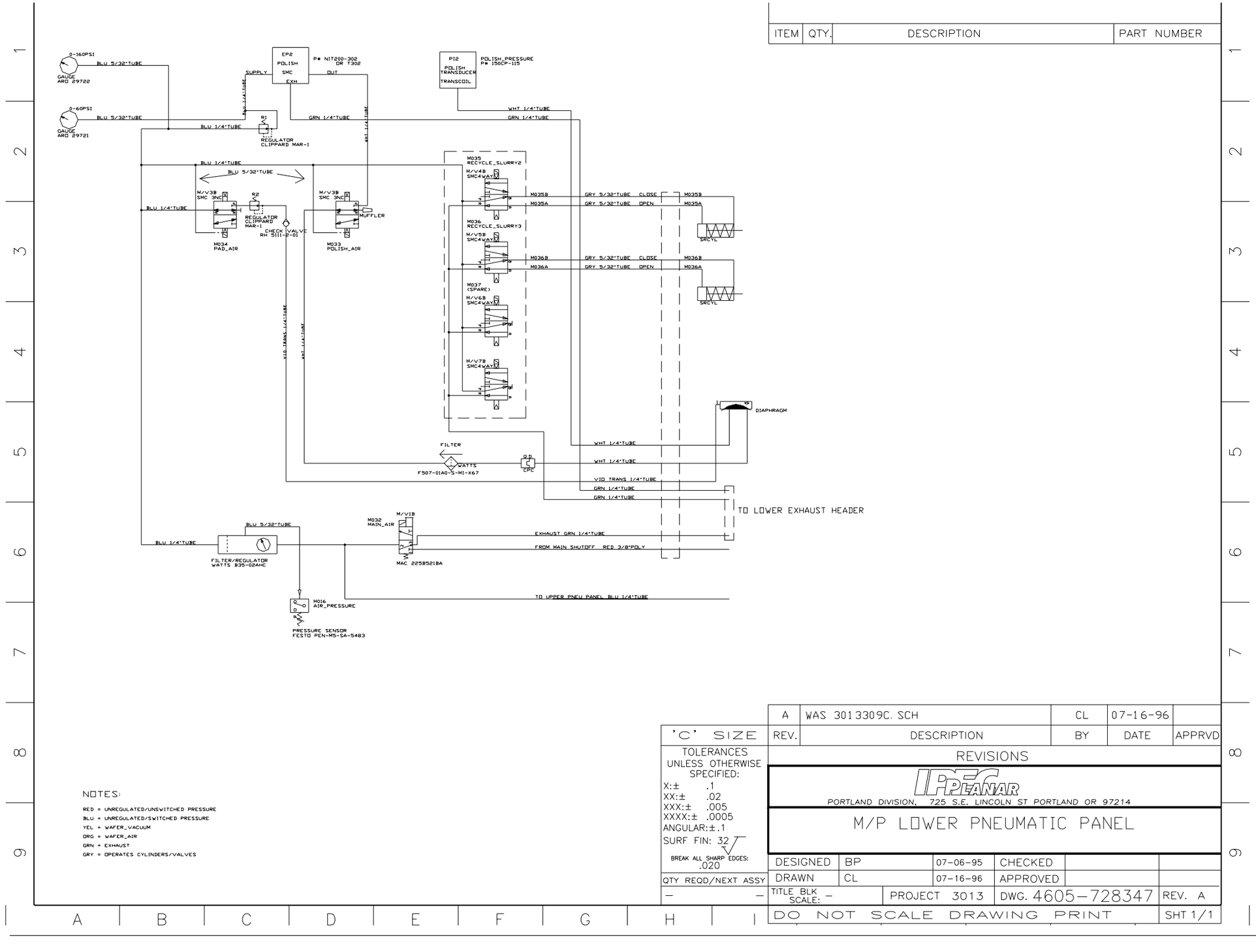
M / P Upper Pneumatic Panel

4605-728346



M/P Lower Pneumatic Panel

4605-728347



ITEM	QTY.	DESCRIPTION	PART NUMBER

NOTES:

RED = UNREGULATED/UNSWITCHED PRESSURE
BLU = UNREGULATED/SWITCHED PRESSURE
YEL = WAFER_VACUUM
ORG = WAFER_AIR
GRN = EXHAUST
GRY = OPERATES CYLINDERS/VALVES

'C' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.1
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

QTY REQD/NEXT ASSY
– –

REV.	DESCRIPTION	BY	DATE	APPRVD
A	WAS 3013309C. SCH	CL	07-16-96	

REVISIONS

IPEC PLANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

M/P LOWER PNEUMATIC PANEL

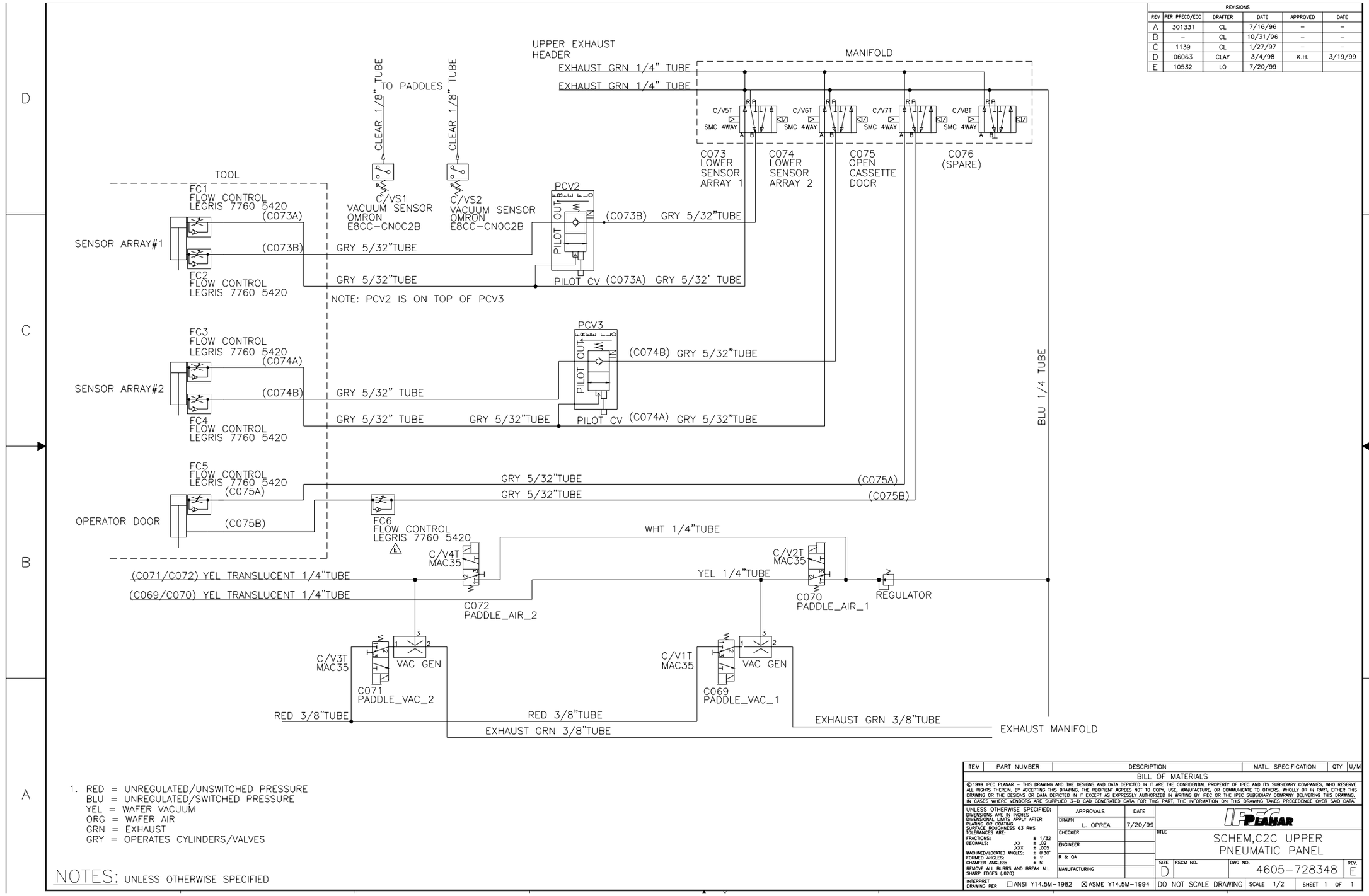
DESIGNED	BP	07-06-95	CHECKED	
DRAWN	CL	07-16-96	APPROVED	
TITLE BLK SCALE: –	PROJECT 3013	DWG. 4605-728347		REV. A
DO NOT SCALE DRAWING PRINT				SHT 1/1

Schem, C2C Upper Pneumatic Panel

SpeedFam-IPEC

4605-728348

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
A	301331	CL	7/16/96	–	–
B	–	CL	10/31/96	–	–
C	1139	CL	1/27/97	–	–
D	06063	CLAY	3/4/98	K.H.	3/19/99
E	10532	LO	7/20/99		



1. RED = UNREGULATED/UNSWITCHED PRESSURE
   BLU = UNREGULATED/SWITCHED PRESSURE
   YEL = WAFER VACUUM
   ORG = WAFER AIR
   GRN = EXHAUST
   GRY = OPERATES CYLINDERS/VALVES

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

© 1999 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3-D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ANSI Y14.5M–1982 ☒ASME Y14.5M–1994

APPROVALS	DATE
DRAWN L. OPREA	7/20/99
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

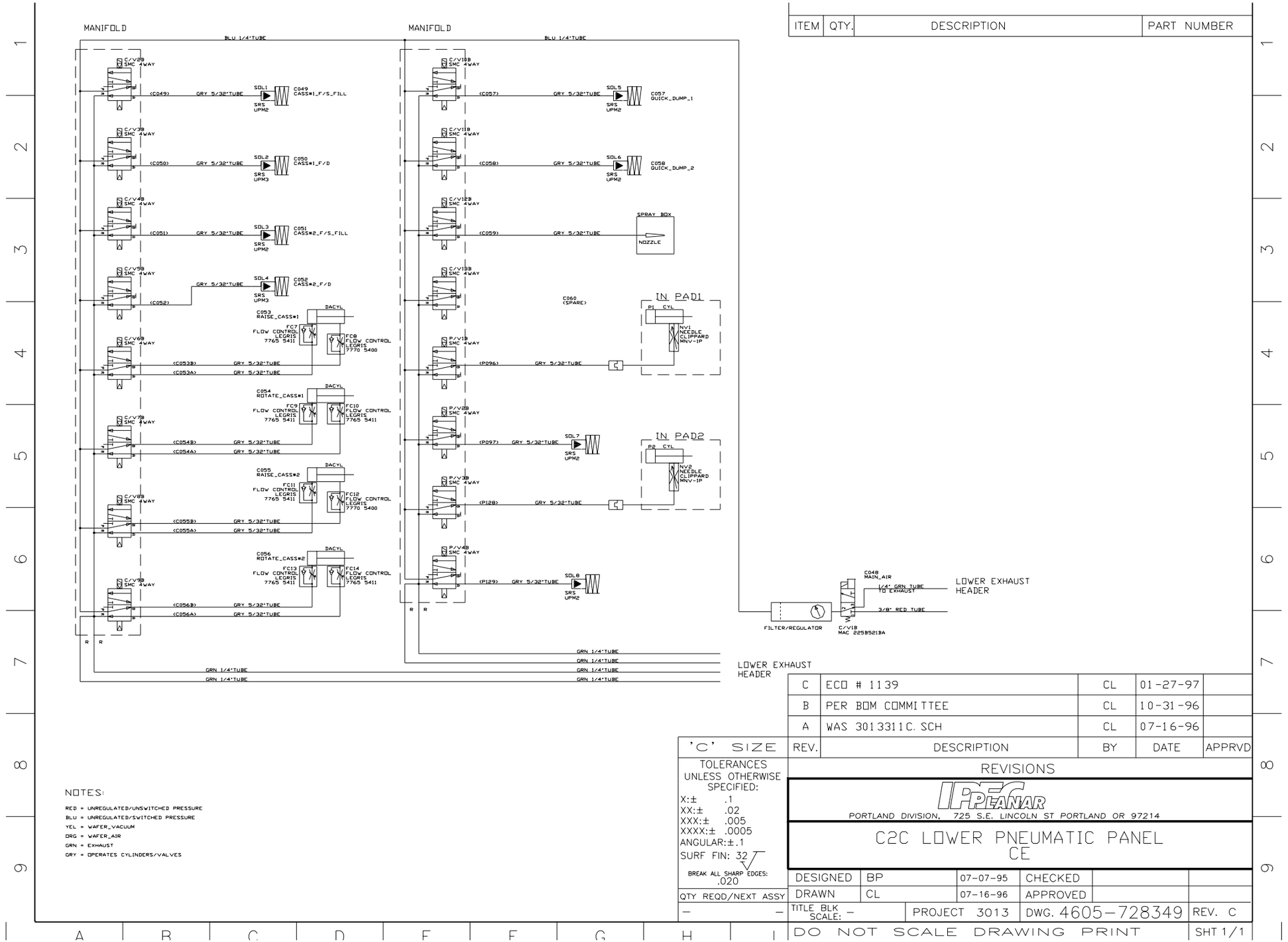
TITLE: SCHEM,C2C UPPER PNEUMATIC PANEL

SIZE	FSCM NO.	DWG NO.	REV.
D		4605–728348	E

DO NOT SCALE DRAWING | SCALE 1/2 | SHEET 1 OF 1

C2C Lower Pneumatic Panel CE

4605-728349



ITEM	QTY.	DESCRIPTION	PART NUMBER

NOTES:

RED = UNREGULATED/UNSWITCHED PRESSURE
BLU = UNREGULATED/SWITCHED PRESSURE
YEL = WAFER_VACUUM
ORG = WAFER_AIR
GRN = EXHAUST
GRY = OPERATES CYLINDERS/VALVES

REV.	DESCRIPTION	BY	DATE	APPRVD
C	ECO # 1139	CL	01-27-97	
B	PER BOM COMMITTEE	CL	10-31-96	
A	WAS 3013311C. SCH	CL	07-16-96	

REVISIONS

'C' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.1
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

QTY REQD/NEXT ASSY: – –

IPC PLANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

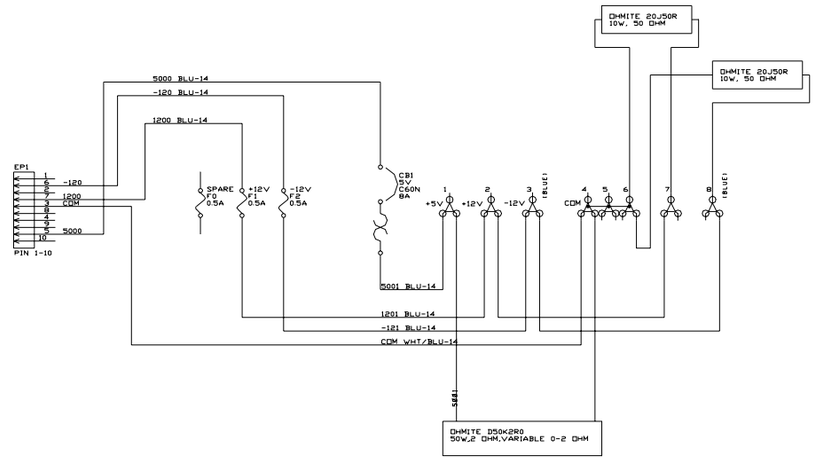
C2C LOWER PNEUMATIC PANEL CE

DESIGNED	BP	07-07-95	CHECKED		
DRAWN	CL	07-16-96	APPROVED		
TITLE BLK SCALE: –		PROJECT 3013	DWG. 4605-728349		REV. C
DO NOT SCALE DRAWING PRINT					SHT 1/1

Load Panel CE 1 of 2

SpeedFam-IPEC

4605-728356



ITEM	QTY.	DESCRIPTION	PART NUMBER

REV.	DESCRIPTION	BY	DATE	APPRVD
C	ECO # 1076, 1139	CL	01-27-97	
B	ECO: 1076	CL	10-04-96	
A	WAS 3033349A. SCH	CL	08-20-96	

'C' SIZE

TOLERANCES UNLESS OTHERWISE SPECIFIED:
X:± .1
XX:± .02
XXX:± .005
XXXX:± .0005
ANGULAR:±.1
SURF FIN: 32
BREAK ALL SHARP EDGES: .020

QTY REQD/NEXT ASSY
– –

REVISIONS

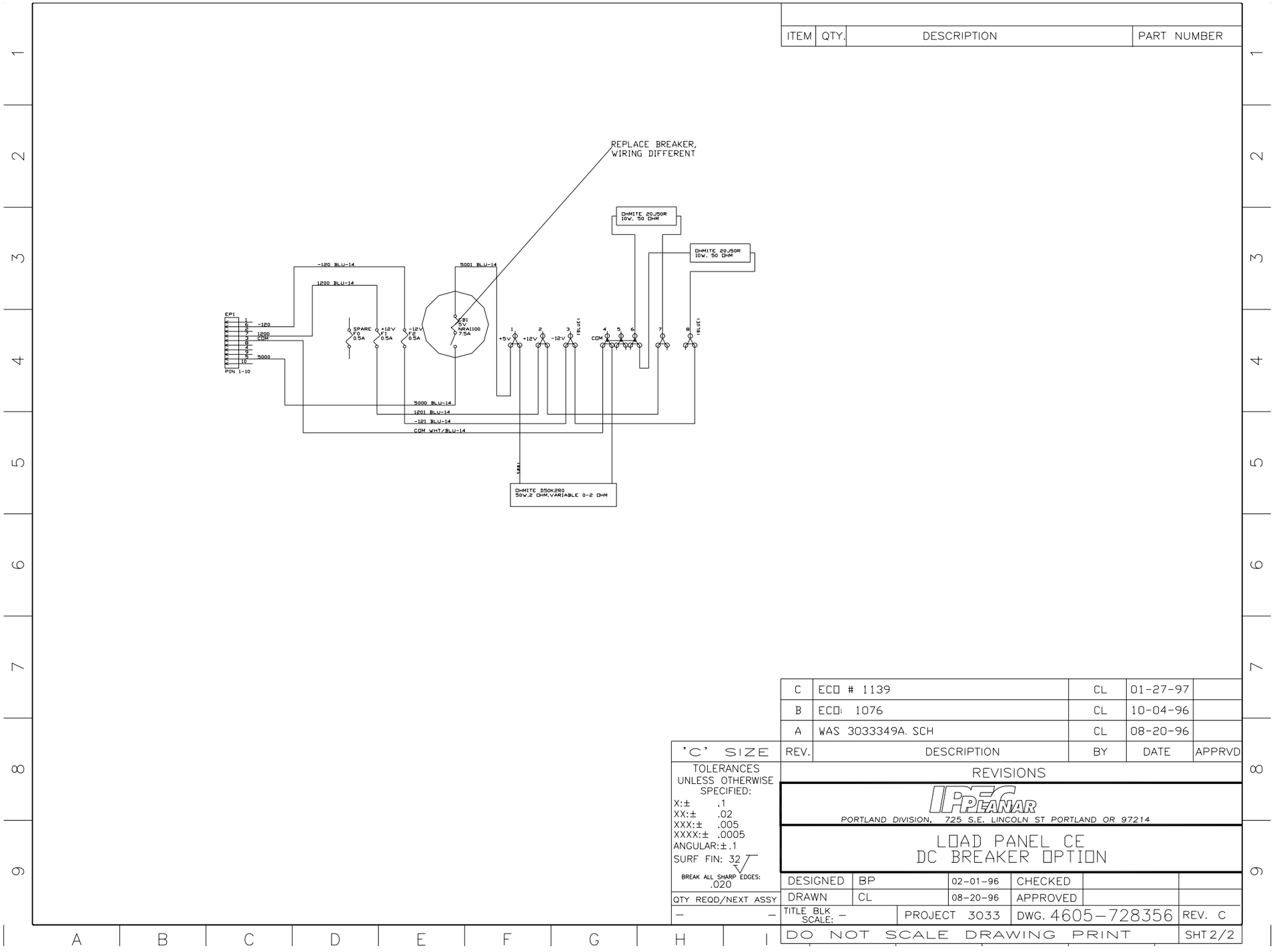
IPC PLANAR
PORTLAND DIVISION, 725 S.E. LINCOLN ST PORTLAND OR 97214

LOAD PANEL CE

DESIGNED	BP	02-01-96	CHECKED		
DRAWN	CL	10-04-96	APPROVED		
TITLE BLK SCALE: –	PROJECT 3033		DWG. 4605-728356		REV. C
DO NOT SCALE DRAWING PRINT					SHT 1/2

Load Panel CE DC Breaker Option 2 of 2

4605-728356



Comm Interconnect Cables (Version U1) 1 of 2

4605-728357

REVISIONS					
REV	PER PPECO/ECO	DRAFTER	DATE	APPROVED	DATE
D	05415	MSR	8/29/98		
E	06458	JSK	6/14/98		
F	06648	JSK	11/6/98	HAGEMAN	1/6/98
G	10075	DP	12/16/98		

SYSCON
586–100
I/O
ETHERNET
2 HDD
I/O

EP
486 DX4–100
PCL–818L
ETHERNET
HDD

C2C
486 DX4–100
RS485/RS232
ETHERNET
HDD
COM2 232 (GENMARK)
COM2 232 (HINE)
485

MP1
486 DX4–100
RS485
ETHERNET
HDD
COM2 232
485

MP2
486 DX4–100
RS485
ETHERNET
HDD
COM2 232
485

MP3
486 DX4–100
RS485
ETHERNET
HDD
COM2 232
485

MP4
486 DX4–100
RS485
ETHERNET
HDD
COM2 232
485

HV ROBOT PANEL

REMOTE SWITCH CABLE C/A 2810–740524 360 IN. (HINE ONLY)

(GENMARK ONLY)

REMOTE SWITCH CABLE C/A 2810–110475 264 IN.

ROBOT COMM CABLE C/A 2810–110476 300 IN.

HINE ROBOT CABLE C/A 2810–740524 360 IN.

MISTIC COMM CABLE 1 C/A 2810–110471 60 IN.

ROBOT CONTROLLER GENMARK

HINE ROBOT

COMPUTER PL1 TO CTRLR PL2 RPO C/A 2810–109612 120 IN.

MISTIC COMM CABLE 1 C/A 2810–110471 60 IN.

SMART STEP CONTROLLER

PC#1 HV PANEL 2 G

PC#1 HV PANEL 2 G

PC#2 HV PANEL 2 G

PC#2 HV PANEL 2 G

G4RCOMMKIT C2C LOW VOLTAGE PANEL

MISTIC COMM CABLE 2 C/A 2810–110472 36 IN.

MISTIC RIBBON CABLE C/A 2810–110470 #MRC1 108 IN.

RACK #0
RACK #1
RACK #2
RACK #3
RACK #4

RACK #5 SBTA
MISTIC COMM CABLE 4 C/A 2810–110474 9.5 IN.
RACK #6 SBTA
MISTIC COMM CABLE 4 C/A 2810–110474 9.5 IN
RACK #9 SBTA

PC #1 LOW VOLTAGE PANEL

MISTIC COMM CABLE 3 C/A 2810–110473 240 IN.

RACK #7 SBTA
MISTIC COMM CABLE 4 C/A 2810–110474 9.5 IN.
RACK #8 SBTA
MISTIC COMM CABLE 4 C/A 2810–110474 9.5 IN.
RACK #10 SBTA

G4TERMR

G

PC #2 LOW VOLTAGE PANEL

G4RCOMMKIT MP1 LOW VOLTAGE PANEL

G4RCOMMKIT MP2 LOW VOLTAGE PANEL

G4RCOMMKIT MP3 LOW VOLTAGE PANEL

G4RCOMMKIT MP4 LOW VOLTAGE PANEL

2 ITEMS IDENTIFIED FOR APM SYSTEM ONLY. G

1. SEE SHT 2 FOR SCHEMATIC DIAGRAMS.

NOTES: (UNLESS OTHERWISE SPECIFIED)

ITEM	PART NUMBER	DESCRIPTION	MATL. SPECIFICATION	QTY	U/M

BILL OF MATERIALS

© 1998 IPEC PLANAR – THIS DRAWING AND THE DESIGNS AND DATA DEPICTED IN IT ARE THE CONFIDENTIAL PROPERTY OF IPEC AND ITS SUBSIDIARY COMPANIES, WHO RESERVE ALL RIGHTS THEREIN. BY ACCEPTING THIS DRAWING, THE RECIPIENT AGREES NOT TO COPY, USE, MANUFACTURE, OR COMMUNICATE TO OTHERS, WHOLLY OR IN PART, EITHER THIS DRAWING OR THE DESIGNS OR DATA DEPICTED IN IT EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY IPEC OR THE IPEC SUBSIDIARY COMPANY DELIVERING THIS DRAWING. IN CASES WHERE VENDORS ARE SUPPLIED 3–D CAD GENERATED DATA FOR THIS PART, THE INFORMATION ON THIS DRAWING TAKES PRECEDENCE OVER SAID DATA.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
DIMENSIONAL LIMITS APPLY AFTER PLATING OR COATING
SURFACE ROUGHNESS 63 RMS
TOLERANCES ARE:
FRACTIONS: ± 1/32
DECIMALS: .XX ± .02, .XXX ± .005
MACHINED/LOCATED ANGLES: ± 0°30'
FORMED ANGLES: ± 1°
CHAMFER ANGLES: ± 5°
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES (.020)
INTERPRET DRAWING PER ☐ ANSI Y14.5M–1982 ☒ ASME Y14.5M–1994

APPROVALS	DATE
DRAWN PRESSLER	12/16/98
CHECKER	
ENGINEER	
R & QA	
MANUFACTURING	

IPEC PLANAR

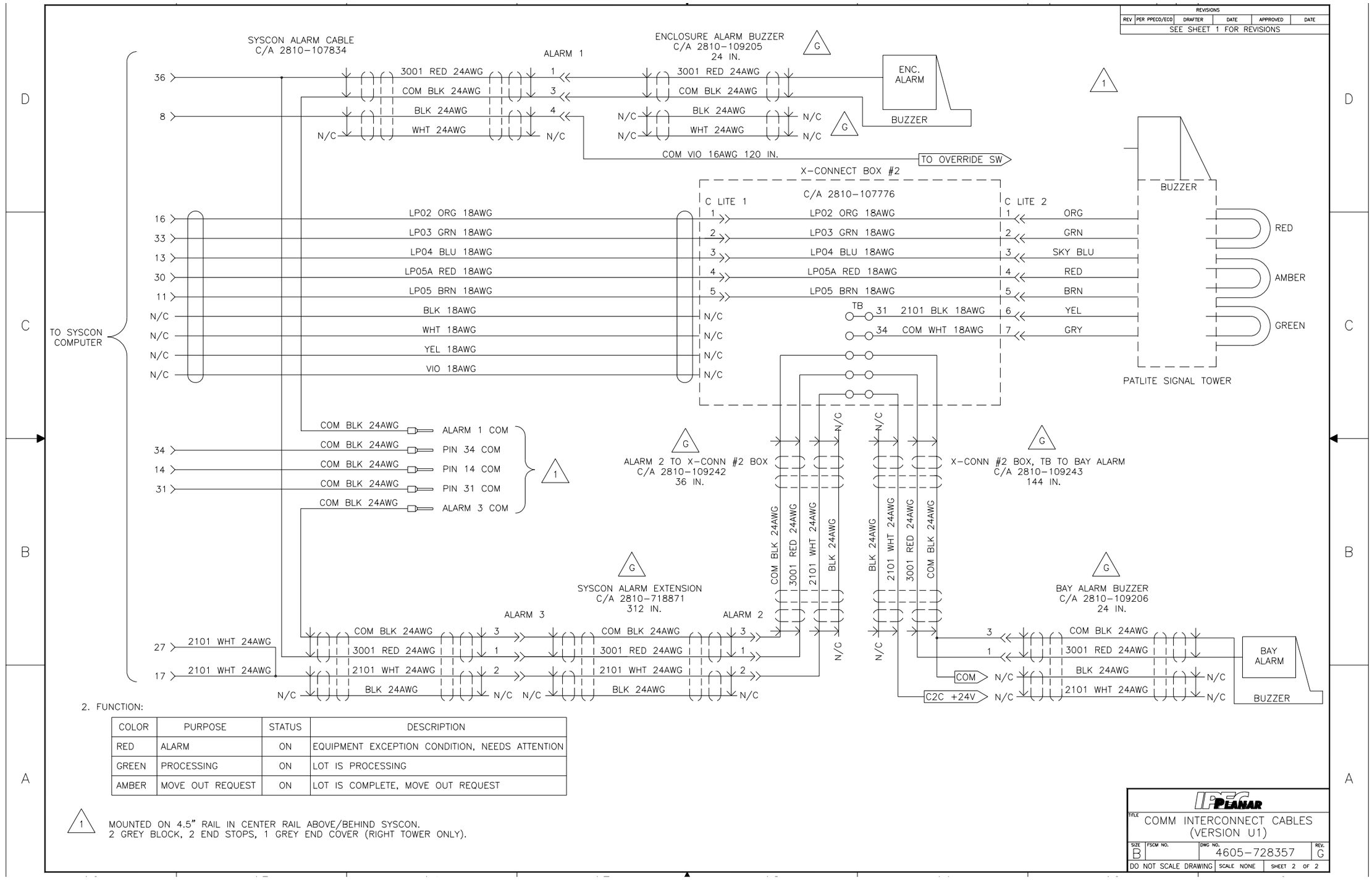
TITLE: COMM INTERCONNECT CABLES (VERSION U1)

SIZE B | FSCM NO. | DWG NO. 4605–728357 | REV. G

DO NOT SCALE DRAWING | SCALE NONE | SHEET 1 OF 2

Comm Interconnect Cables (Version U1) 2 of 2

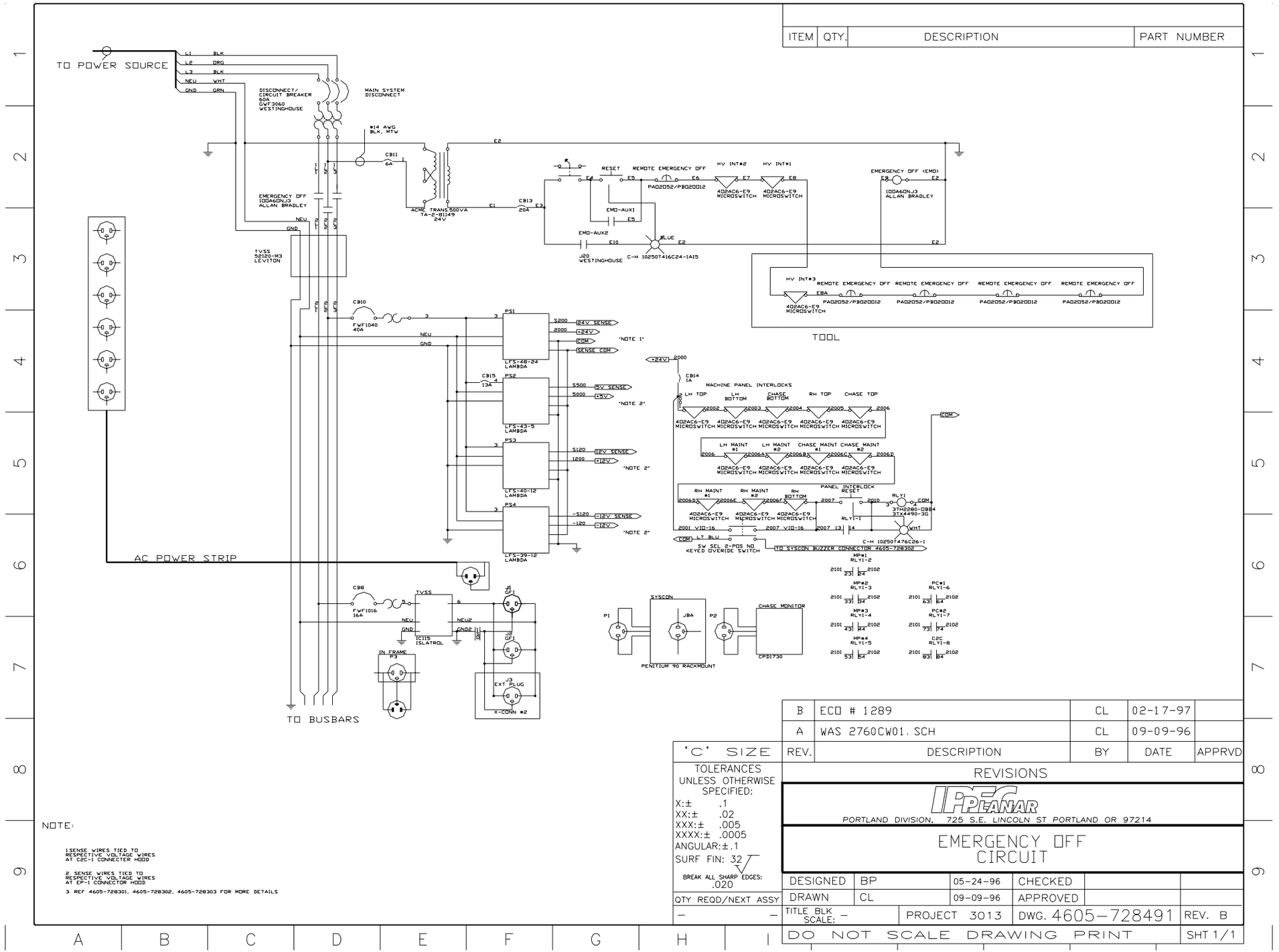
4605-728357



COLOR	PURPOSE	STATUS	DESCRIPTION
RED	ALARM	ON	EQUIPMENT EXCEPTION CONDITION, NEEDS ATTENTION
GREEN	PROCESSING	ON	LOT IS PROCESSING
AMBER	MOVE OUT REQUEST	ON	LOT IS COMPLETE, MOVE OUT REQUEST

Emergency Off Circuit

4605-728491



Index

A

Acronyms and Abbreviations, A-9

Additional Manuals

- CD-ROM Manual Set, 1-6
- Computer Host Interface Manual, 1-6
- Illustrated Parts Breakdown, 1-6
- Installation Guide, 1-6
- Maintenance Manual, 1-6
- User Manual, 1-6

Alarm Messages, 3-23

Annex B Addendum, D-1

B

Barriers, 3-56

C

C2C

- Analog I/O Tables, B-31
- Cassette to Cassette System, 1-19
- Discrete I/O Tables, B-3
- Pneumatic Panels, 1-24

Caution, Definition, 1-4, 3-5

CE Compliance, 3-83

Chemical Hazards, 3-67

Cleaning and Spills, 3-78

Contents of Shipping Crates, 4-3

D

Danger, Definition, 1-4, 3-5

Delta P

- C2C Upper and Lower Pneumatic Panel Assemblies, 1-25
- MP Lower Pneumatic Panel Assembly, 1-17
- MP Upper Pneumatic Panel Assembly, 1-15

Dimensions

- Tool, 2-3

Drawings, E-1

E

Electrical

- Grounding, 3-51
- Hazards, 3-41

Electrical Cabinet, 1-42

- Control Station, 1-44
- SysCon Computer, 1-44

Electrical Cabinet View, 1-11

Electrical Ratings, 4-18

Emergency OFF (EMO) Circuit, 3-14

EMO

- Locations, 3-16
- Reset, 3-17

End Point Detection System

- Brookside, 1-50
- Filmetrics, 1-51
- Luxtron, 1-52

Environmental Requirements, 2-8

Continued on next page

Index, continued

Ergonomics, 3-81

Exhaust Requirements, 2-9

F

Facilities

- Connection Procedures, 4-17
- Connections, 4-19

Facilities Connections

- Checklists, 4-20

Facility

- Requirements, 2-4
  - Introduction, 2-4

Fingerprint Equipment List, 5-6

Fluid Connections, 2-6

Fluids System, 1-38

G

General Hazards, 3-81

Glossary, A-1

H

High Voltage Locations, 3-47

Hine Robot

- Custom Wrist and Arm, 1-30
- EMO Switch, 1-33
- Overview, 1-31
- Robot Body, 1-31, 1-33
- Robot Specifications, 1-32
- Teach Pendant, 1-33
- Z Axis Brake, 3-35

I

I/O Tables, B-1

- C2C Analog, B-31
- C2C Discrete, B-3
- MP Analog, B-41
- MP Discrete, B-32

Installation Check Procedure, 5-3

Interconnect Boxes, 1-48

L

Laser, 3-82

Level Main Tool, 4-11

Light Tower, 3-24

Lockout Feature, 3-2

Luxtron

- Endpoint Detection System
  - Overview, 1-52

M

Material Safety Data Sheets, 3-76

Mechanical Hazards, 3-26

Mistic Driver Codes, C-1

Moving Procedures, 4-2

MP

- Analog I/O Tables, B-41
- Discrete I/O Tables, B-32
- Lower Pneumatic Panels, 1-17
- Modules, 1-13
- Upper Pneumatic Panels, 1-15

MSDS, 3-76

Continued on next page

Index, continued

N

Neutral Wire Color, 3-42

Note, Definition, 1-4, 3-5

O

OEM Manuals

Brookside, 1-50

Operator and Chase Side Views, 1-10

P

Pad Conditioning System, 1-36

Placement In FAB, 4-10

Process Overview, 1-7

Protective Earth Ground, 3-51

Q

Qualification, 6-2

Requirements, 6-3

R

Receiving Inspection, 4-5

Required Support Equipment, 4-15

Revision Change Suggestion Form, R/CSF-1

Robot

Custom Wrist, 1-30
Gencobot, 1-29
Hine, 1-31
Z Axis Brake, 3-35

S

S2-93 Compliance, 3-83

Safety Hazards

Airborne Noise, 3-80
Chemical, 3-67
Electrical, 3-41
Functional, 3-2
General, 3-81
General Operational, 3-2
Laser, 3-82
Mechanical, 3-26

Seismic Restraint Mounting, 4-12

SEMI S2-91, S2-93 Guidelines, 3-55

ServSwitch, 1-44

Setup and Fingerprint, 5-2

Shipping and Storage Requirements, 4-4

Site Preparation, 2-2

Slurry

Module, 1-40
System, 1-39

SpeedFam-IPEC Installation Support, 4-14

Spills, 3-78

Spray Box Assembly, 1-27

Sub-Frame, DWO 1 of 7

Drawing, E-2, E-3, E-4, E-5, E-6, E-7, E-8, E-9, E-13, E-14, E-15, E-16, E-17, E-18, E-19, E-22, E-23, E-24

Index, continued

System

Interlocks, 3-19
Malfunction, 3-23

T

Tip-n-Tell Indicators, 4-5

Tool

Dimensions, 2-3
Fingerprint Checklist, 5-7
Operation, 1-53
Overview
Luxtron
Endpoint Detection System, 1-52
Systems Overview, 1-12

Troubleshooting

and Diagnostics, 7-1
Tables, 7-3

U

Uncrating Procedures, 4-7

Unloading, 4-6

V

Vacuum

I/O Definition, B-2

W

Wafer and Polish Heads, 1-14

Wafer Sensor Array, 1-22

Warning, Definition, 1-4, 3-5

Wet Cassette Assembly, 1-20

Revision / Change Suggestion Form

Instructions To submit a suggested change or amendment to this document please submit the information on the Internet at http://www.sfamipecfieldops.com/rcsform.htm or, fill in all information on this form and mail to:

SpeedFam-IPEC
305 North 54th Street
Chandler, AZ 85226
Attn: Information Development and Delivery or submit the request to your service representative.

Item	Information / Change
Document Title:	**AvantGaard™ 676 Installation Guide** Rev B
Chapter/Page:	
Information as presently written: (Use additional pages, as needed, or attach copy of actual page)	

Continued on next page

Please copy both sides of this form, as necessary.

Revision / Change Suggestion Form, continued

Suggested Revision / Change: (Use additional pages, as needed)	
Suggested by:	
Address / Phone Number	